SVAN 106

Vibration Meter

USER'S MANUAL

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Notice: *This user's manual presents the software revision named 3.13.1 (cf. the description of the* ***Unit Label*** *position of the* ***Instrument*** *list). The succeeding software revisions (marked with the bigger numbers) can slightly change the view of some displays presented in the text of the manual.*

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1 INTRODUCTION

The SV 106 is a new six-channel human vibration meter and analyser. Instrument meets ISO 8041:2005 standard and it is an ideal choice for measurements according to ISO 2631-1,2&5 and ISO 5349.

This pocket-size instrument performs simultaneous measurements with two triaxial accelerometers (e.g. both-hands vibration or triaxial SEAT transmission measurements are possible).The **RMS**, **Peak**, **Peak-Peak**, **VDV**, **MTVV** or **Dose** results with all required weighting filters for the HVM measurements are available with this instrument. Advanced time-history logging and time-domain signal recording (according to the ISO 2631-5) to built-in Micro SD flash card give almost unlimited capabilities of data storage. Results can be easily downloaded to PC using USB interface and SvanPC+ software.

The Whole-Body vibration measurement is easier thanks to SV 38 seat-accelerometer which can be placed directly on the seat-cushion, floor or fixed to the back of the seat.

The SV 50 set with triaxial accelerometer enables Hand-Arm vibration measurements regardless of the type of evaluated tool.

Additionally, for measurements of very high impulse vibration the special adapter SA 55, with low pass mechanical filter protecting accelerometer from DC shift effect, is available. Evaluation of the grip force will be accessible with dedicated “integrated adapter” SV 105 (under development stage).

Fast USB 1.1 interface (12 MHz) creates real time link for the PC "front-end" application of the **SVAN 106** instrument. The measurement results can be downloaded to PC using all mentioned above interfaces.

The instrument is powered from four AA standard or rechargeable batteries (i.e. NiMH - separate charger is required). The powering of the instrument from the USB interface is also provided. Robust and lightweight design accomplishes the exceptional features of this new generation instrument.

1.1. SVAN 106 main features

- Human Vibration measurements meeting ISO 8041:2005,
- ISO 2631-1,2&5 (including VDV and MTVV) and ISO 5349
- Six channels for acceleration (IEPE type) and two channels for force measurements
- Whole-Body measurements:
  - Low-cost seat accelerometer SV 38V
- Hand-Arm measurements:
  - SV 50 triaxial accelerometer with set of adapters
  - SA 55 adapter with triaxial mechanical filter
  - SV 105 integrated triaxial accelerometer adapter including grip force sensor (under development)
- Time-domain signal recording (meeting ISO 2631-5)
- Advanced data logger including spectral analysis
- Micro SD flash card for mass data storage
- USB 1.1 Client interface
- Integration time programmable up to 24 h
- SvanPC+ software for easy instrument setup and data download
- Easy in use, user friendly interface with colour display

- Pocket size (140 x 83 x 33 millimetres)
- Weight only 390 grams including batteries

1.2. Accessories included

The SV 106 set consist of the following parts:

- SV 106 instrument with 4 AA batteries or 4 rechargeable AA batteries installed.
- SC 56 cable
- **SV 38V** low cost triaxal accelerometer for Whole—Body measurements (MEMS type)
- **SV 105** integrated triaxal Hand-Arm adapter with grip force sensor (under development)

1.3. Accessories available

- **SV 50** set for Hand-Arm measurement (Dytran accelerometer 3023M2; adapters SA 50, SA 51, SA 52
- **SV 111** – vibration calibrator (100 rad/1ms^{-2}, 500 rad/10ms^{-2}, 1000 rad/10ms^{-2})

SVAN 106 instrument

2 MANUAL CONTROL OF THE INSTRUMENT

The control of the instrument is developed in the fully dialogue way. The user can operate the instrument by selecting the proper position from the **Menu** list. Thanks to that, the number of the control push-buttons of the instrument is reduced to nine.

2.1 Control push-buttons on the front panel

On the front panel of the instrument, there are located the following control push-buttons:

- **<ENTER>**, **(<Menu>)**, **[<Save>]**,
- **<ESC>**, **(<Cal.>)**, **[<S/P>]**,
- **<Shift>**, [Markers]
- **<Alt>**, [Markers]
- **<▲>**,
- **<◀>**,
- **<▶>**,
- **<▼>**,
- **<Start/Stop>**.

The name given in (...) brackets denotes the second push-button function which is available after pressing it in conjunction (or in sequence) with the **<Shift>** push-button. For the first two push-buttons the name given in square brackets […] denotes also the third push-button function which is available after pressing it in conjunction (or in sequence) with the **<Alt>** push-button.

<Shift>

The second function of a push-button (written in red colour on a push-button) can be used when the **<Shift>** push-button is pressed. This push-button can be used in two different ways:

- as **Shift** in the keyboard (e.g. while typing the filename); both **<Shift>** and the second push-button must be pressed in parallel;
- as **2nd Fun**; this push-button can be pressed and released before pressing the second one or pressed in parallel (while operating in *"**2nd Fun**"* mode, see the following notice) with the second push-button.

The **<Shift>** push-button pressed in conjunction with the **<Alt>** one enables the user to enter the **Markers** on the plots during the measurement.

Notice: *The operation of this push-button can be set as the "**Direct**" mode or the "**2nd Fun**." mode in the **Shift/Alt** position (path: Menu / Instrument / Keyboard Settings) - see description of the **Instrument** list.*

<Alt>

This push-button enables one to choose the third push-button function in case of **[<Save>]** and **[<Pause>]** push-buttons. In order to select the third function the user must press the **<Alt>** and the second push-button simultaneously.

Notice: *The simultaneous pressing of the* ***<Alt>*** *and* ***<Start/Stop>*** *push-buttons switches the instrument on and off.*

<Start/Stop>

This push-button enables one to start the measurement process, when the instrument is not measuring or to stop it, when the instrument is in course of the measurement. It is also possible to set such mode of this push-button, in which in order to start or stop the measurements the user has to press it simultaneously with the **<Shift>** one.

Notice: *The change of the* ***<Start/Stop>*** *push-button mode is performed in the* ***Keyboard Settings*** *window of the* ***Instrument*** *list (see description of the* ***Instrument*** *list).*

<ENTER>

This push-button enables one to enter the selected operation mode or to confirm the control options. Some additional functions of this push-button will be described in the following chapters of this manual.

(<Menu>)

This push-button (pressed together with the **<Shift>** one) enables the user to enter the main list containing six sub-lists: **Function**, **Measurement**, **Display**, **File**, **Instrument**, **Auxiliary Setup**. Each of the mentioned above sub-lists consists of the sub-lists, elements and data windows. These main sub-lists will be described in details in the following chapters of the manual. Double pressed **<Menu>** push-button enters the list containing eight last opened sub-lists. It often speeds up the control of the instrument as the user has the faster access to the frequently used sub-lists.

[<Save>]

This push-button (pressed together with the **<Alt>** one) enables the user to save measurement results as a file in the internal instrument's memory or on the SD-card.

<ESC>

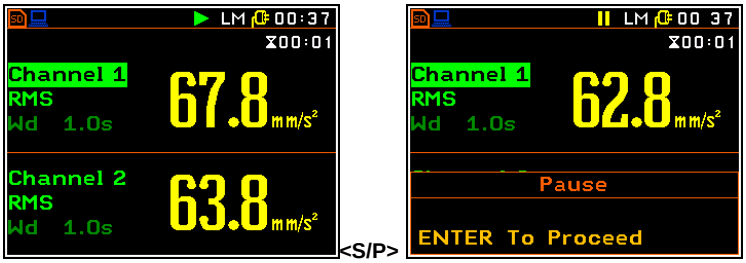
This push-button closes the control lists, sub-lists or windows. It acts in opposite to the **<ENTER>** push-button. When the window is closed pressing the **<ESC>** push-button, any changes made in it are ignored in almost all cases.

([Cal.])

This push-button (pressed together with the **<Shift>** one) enters the **Calibration** sub-list in which the user can enter one of the available sub-lists (**Calibr. by Sensitivity**, **Calibr. by Measurement**, **Last Calibration** and **Clear Calibr. History**).

[<S/P>]

This push-button enables one to jump to the **Setup Manager** window or to break the measurement process temporarily.



Measurement window with Pause message

<◄>, <►>

These push-buttons enable one, in particular, to:

- select the column in a multi column parameter list;
- select the parameters value in an active position (e.g. filter Z, A or C, Integration period: 1s, 2s, 3s, … etc.);
- control the cursor in Spectrum and Logger modes of result's presentation;
- select the position of the character in the text edition;
- activate markers 2 and 3
- speed up the changing of the numerical values of the parameters when pressed and hold.

(<◄>, <►>)

The **<◄>**, **<►>** push-buttons pressed in conjunction (or in sequence) with the **<Shift>** enable one, in particular, to:

- speed up the changing of the numerical values of the parameters (i.e. the step is increased from 1 to 10 in the setting of **Start Delay** - *path: Menu / Measurement / General Settings / Start Delay*);
- jump to the end or first character of edited text line in the text edition modes,

Some other possible reactions of the instrument on the pressing of these push-buttons will be described in details in the following chapters.

[<◄>, <►>]

The **<◄>**, **<►>** push-buttons pressed in conjunction (or in sequence) with the **<Alt>** enable one, in particular, to:

- select the parameters value in the multi column list,
- insert or delete a character in the text edition modes.

Some other possible reactions of the instrument on the pressing of these push-buttons will be described in details in the following chapters.

<▲>, <▼>

The **<▲>**, **<▼>** push-buttons enable one, in particular, to:

- select lines in the list;
- select the proper character from the list in the text edition mode;
- activate markers 1 and 4

Some other possible reactions of the instrument on the pressing of these push-buttons will be described in details in the following chapters.

(<▲>, <▼>)

The **<▲>**, **<▼>** push-buttons pressed in conjunction (or in sequence) with the **<Shift>** enable one, in particular, to:

- change the relation between the Y-axis and X-axis of all plots presented on the screen

Some other possible reactions of the instrument on the pressing of these push-buttons will be described in details in the following chapters.

[<▲>, <▼>]

The **<▲>**, **<▼>** push-buttons pressed in conjunction (or in sequence) with the **<Alt>** enable one, in particular, to:

- change the mode of result's presentation;

Some other possible reactions of the instrument on the pressing of these push-buttons will be described in details in the following chapters.

[Info]

The **Info** (simultaneous pressing the **<◄>**, **<►>** push-buttons) opens the window with the help information in the measurement display modes.

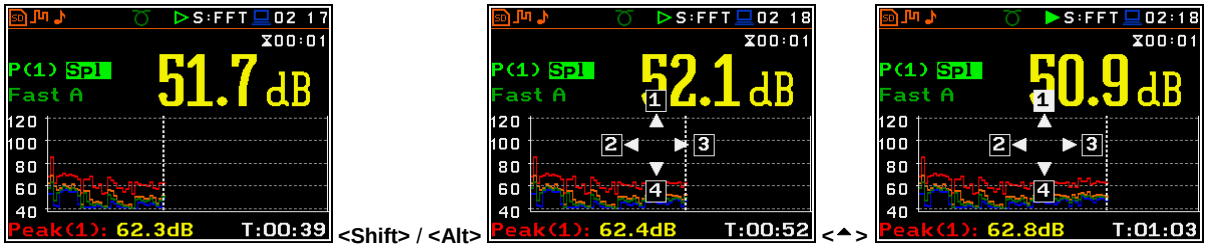
[Markers]

The **Markers** enable the user to mark special events, which occurred during the performed measurements. In order to activate the markers the logger has to be switched on (*path: <Menu> / Measurement / General Settings / Logger Mode: Logger*) and one or more logger results (**PEAK**, **P–P**, **MAX**, **RMS**, **VDV**) in profiles have to be activated (*path: <Menu> / Measurement / Data Logging / Logger Results*).

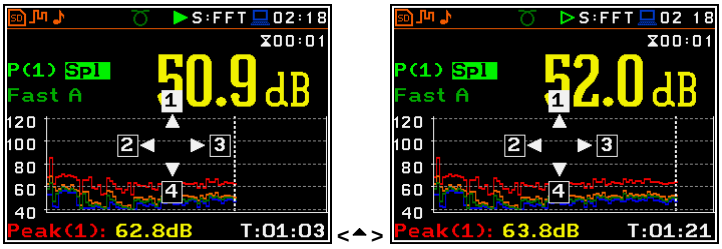
In order to enter the marker the user must press **<Shift>** and **<Alt>** push-buttons simultaneously during the measurement. Then four available markers appears on the screen. To choose marker number 1 the user must press **<▲>** push button (number 2 - **<◀>**, number - 3 **<▶>** and number 4 - **<▼>**).

The markers disappear automatically and chosen marker is activated (after pressing **<Shift>** + **<Alt>** again active marker number will be highlighted). In order to switch off the marker, the user has to pressing **<Shift>** + **<Alt>** and press the arrow push-button, which refers to the marker to be switched off.

The current state of the markers is indicated in the logger's file (cf. App. B for details) and can be used to show them using dedicated presentation software.

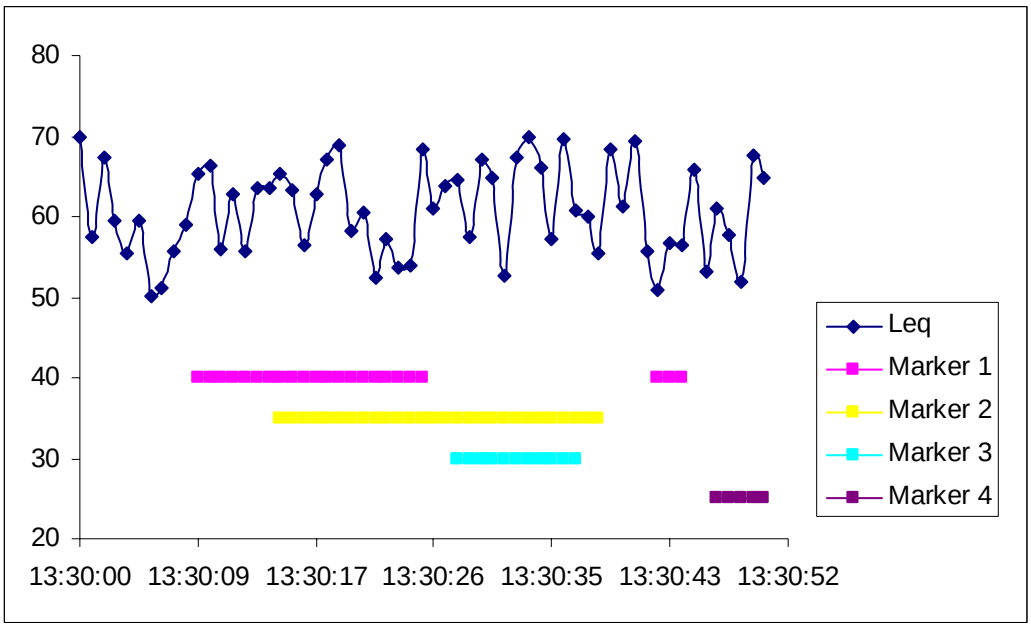


Marker 1 activation



Marker 1 deactivation

The exemplary presentation of the markers on the time history plot is shown below (to view a plot with markers the user has to transfer data to the proper software).



History plot with the indication of the active markers

2.2 Input and output sockets of the instrument

The measurement inputs, called **Channels**, are placed on the top cover of the instrument. There are two 5-pins Lemo compatible sockets type ENB.0B.304 for **Channels 1–3** and **Channels 4-6**, all with IEPE power supply for the accelerometers. The full description of the signals connected to the sockets is given in the Appendix C.

Top cover of the SVAN 106 instrument in 1:1 scale

In the bottom cover there are two sockets, placed from the right to the left as follows: **USB** and **I/O**.

Bottom cover of the SVAN 106 instrument in 1:1 scale

The **USB** Device 1.1 interface is the serial interface working with 12 MHz clock. Thanks to its speed, it is widely used in all PC. In the instrument, the standard 4-pins socket is used described in details in Appendix C.

The additional multi purpose input / output socket, called **I/O**, is a two-pins LEMO socket. On this socket, in the case when the Analogue Output functionality is selected, the signal from the input of the analogue / digital converter (before the correction) is available. This signal can be registered using magnetic recorder or observed on the oscilloscope. The Digital Input as another functionality serves as the external trigger, while the Digital Output is used to generate the trigger pulse or alarm pulse from the instrument.

⚠ ***Notice:*** *Switch the power off before connecting the instrument to any other device (e.g. a printer or a Personal Computer).*

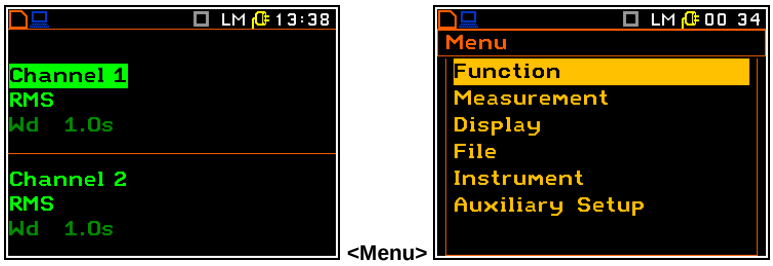
3 SETTING THE INSTRUMENT

In order to perform the measurements using the instrument the user has only to plug-in the proper transducer and to switch the power on.

Notice: *The user has to press the* ***<Alt>*** *and* ***<Start/Stop>*** *push-buttons in parallel in order to switch the power On/Off.*

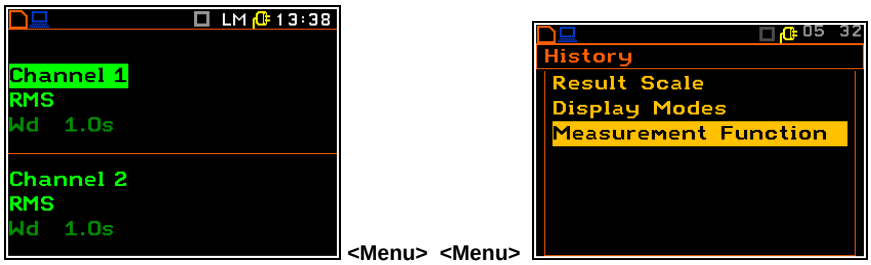
3.1. Basics of the instrument's control

The instrument is controlled by means of nine push-buttons of the keyboard. Using these push-buttons one can access all available functions. The functions are placed in the system of lists and sub-lists which are also called windows. The main list contains the headers of six lists, which also contain sub-lists or positions. The main list is opened after pressing the **<Menu>** push-button. This list contains the following sub-lists: **Function**, **Measurement**, **Display**, **File**, **Instrument** and **Auxiliary Setup**. The elements of each list are described in details in Chapters 4 ÷ 9. Only one list can be accessed at a time, the one which name is highlighted (displayed inversely). The change of the highlighted line is done after pressing the **<▲>**, **<▼>** push-buttons.



Displays with the main menu

After double pressing of the **<Menu>** push-button the scrolled list of recently accessed menu items appears on the display. The example of this list is presented below. Such solution enables one to access the most frequently used lists quickly, without the necessity of passing the whole path.



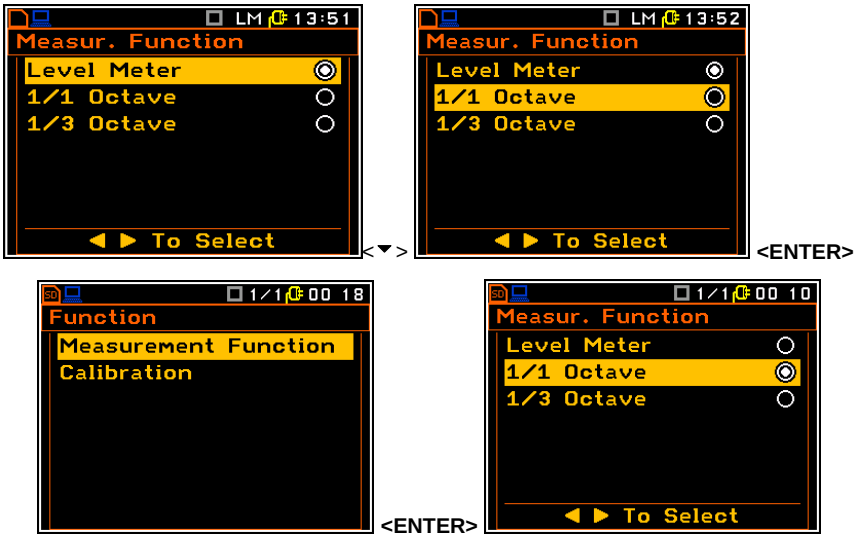
Display with the recently accessed menu items (after double pressing of the <Menu> push-button)

The instrument's menu consists of different type of windows, which may be: main menu list, sub-menu list, option list, parameter list, text editor window, information window and file manager window with file command list. All windows and control options are described just below, exception is the file manager window, which is described in chapter 7 (description of menu **File**).

After the selection of the desired list (the **<▲>** or **<▼>** push-buttons), the user has to press the **<ENTER>** push-button in order to enter it. After this new sub-lists, positions (elements) or various data specification appear on the display.

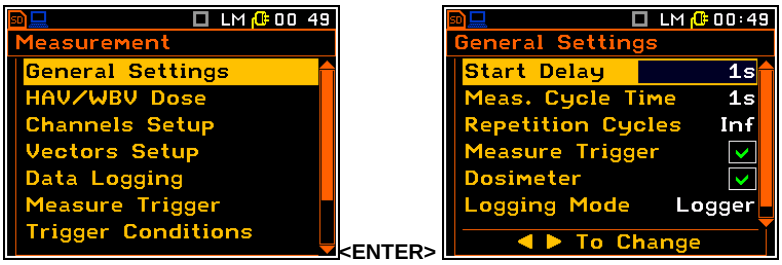
Displays with the main Menu list and the elements of the Measurement list

The option list consists of different options, from which the only one may be selected. The selection of the option is performed next way. The user has to highlight the desired option by means of **<▲>** or **<▼>** push-buttons and then press the **<ENTER>** one. This option became active and the list is closing. When the user enter this list again the selected option will be marked.



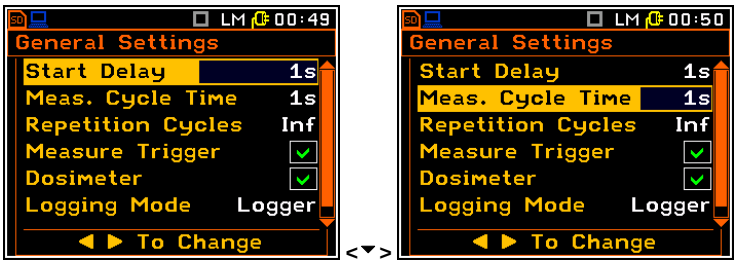
Spectrum Type windows; Velocity option selection

The parameter list contains parameters for which the user may select the value from the certain range. Next pressing of the **<ENTER>** push-button enables one to access mentioned above sub-lists.



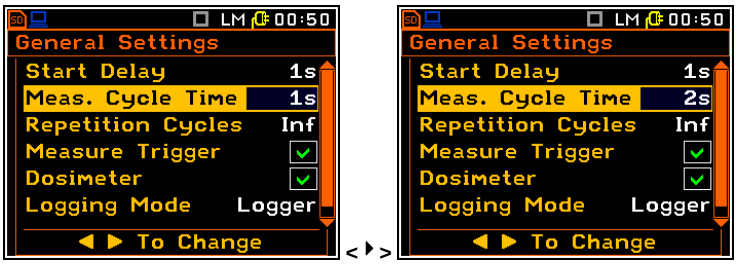
The parameter list window opening

The desired position of a list is accessed after pressing the **<▲>** or **<▼>** push-button.



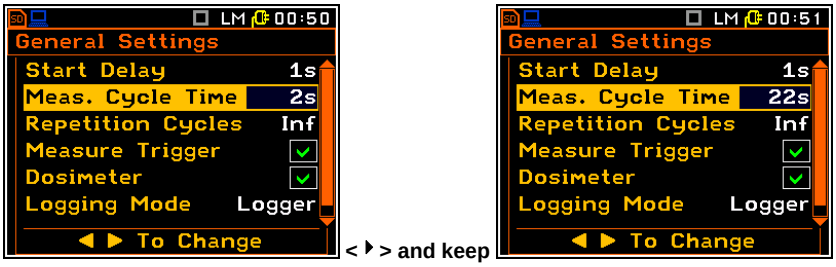
General Settings window; changing the parameter after pressing the <▼> push-button

The change of the value in a selected position is performed by the **<◄>** or **<►>** push-buttons (or pressed together with the **<Shift>** one).



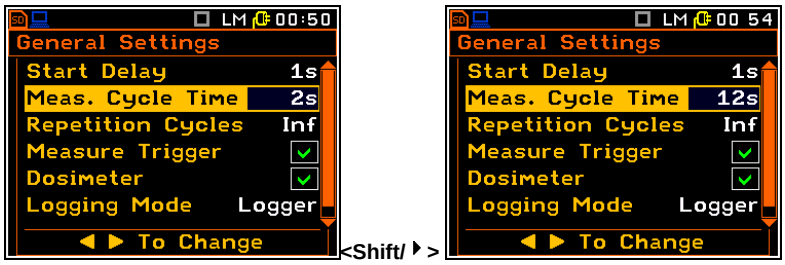
Changing the value of the Measurement Cycle Time parameter after pressing the <►> push-buttons

If the parameter has numerical value the user may to speed up it's selection keep pressing the **<◄>** or **<►>** push-buttons (or pressed together with the **<Shift>** one) longer than 1 second. In this case parameter starts to change automatically until the user releases the pressed buttons.



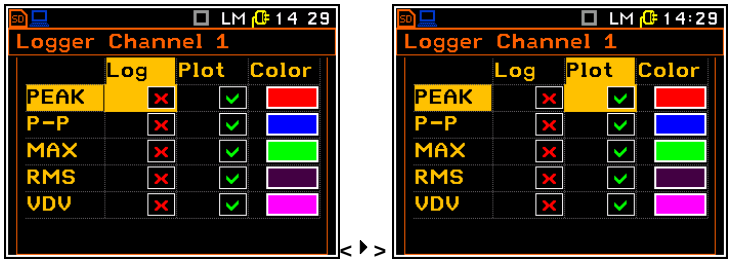
Repetition Cycles value selection after pressing and keeping the <►> push-button

The user may change the numerical parameter value with the step (usually 10, 20) by means of the **<◄>** or **<►>** push-buttons pressed together with the **<Alt>** one.



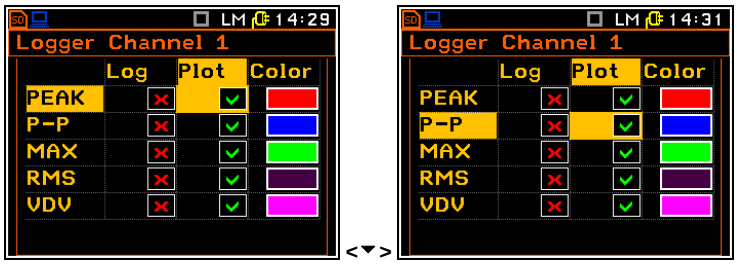
Repetition Cycles value selection after pressing the < > push-button with the <Shift> one

When the list of parameters consists of more than one column the user may change the column with the use of **< >** or **< >** push-buttons staying within the same line.



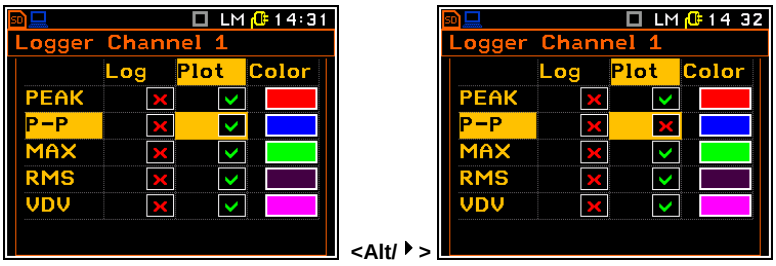
Logger Results list; column changing

With the use of **< >** or **< >** push-buttons the user may change the line in the same column.



Logger Results list; line changing

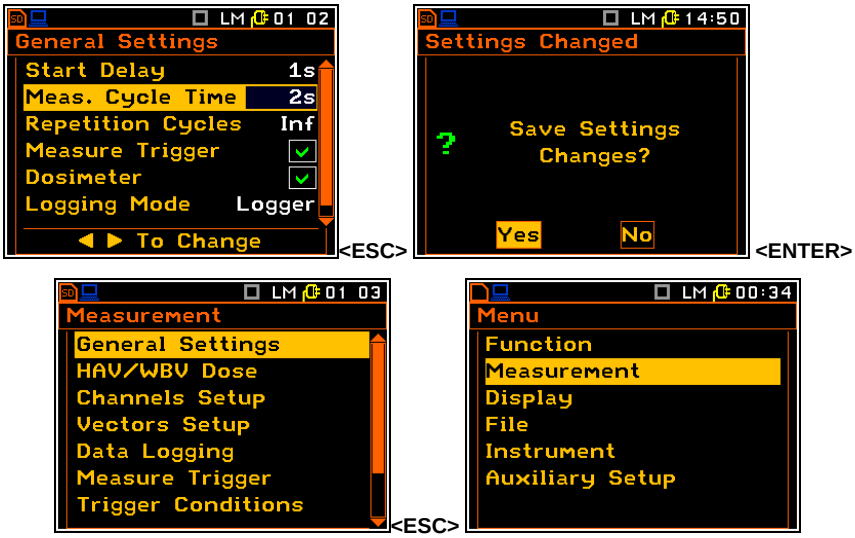
The change of the value in a selected position is performed by the **<Alt>** and **< >** or **< >** push-buttons pressed together.



Logger Results list; Peak result for the second profile deactivation

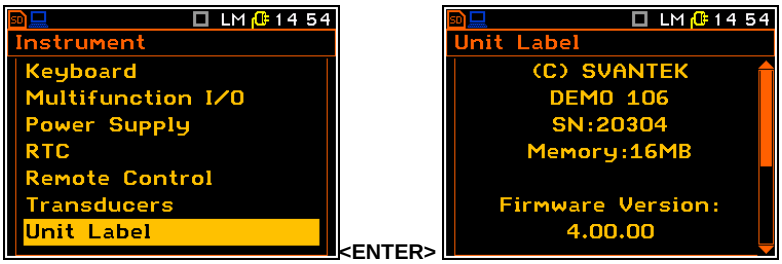
In all cases the **<ENTER>** push-button is used for the confirmation of the selection in a position and for closing the opened sub-list.

The sub-list is closed ignoring changes made in a sub-list by pressing the **<ESC>** push-button.



Displays after three consecutive pressing of the <ESC> push-button from the General Settings sub-list

As it was mentioned, some of the sub-lists end with the windows informing the user about the state of the instrument, available memory, not existing files or loggers, standards fulfilled by the unit, etc. In order to scroll the list, the user has to use the **<▲>** or **<▼>** push-button. In order to close such window, the user has to press the **<ESC>** push-button.



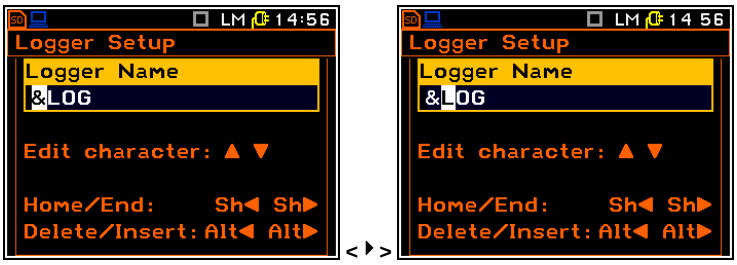
Displays with the accessed Unit Label position

There are also windows, in which the user may edit some text (i.e. the name of the file). This window consists the help information to guide the user how to edit the text.

Displays during the edition of the text – name of the logger file

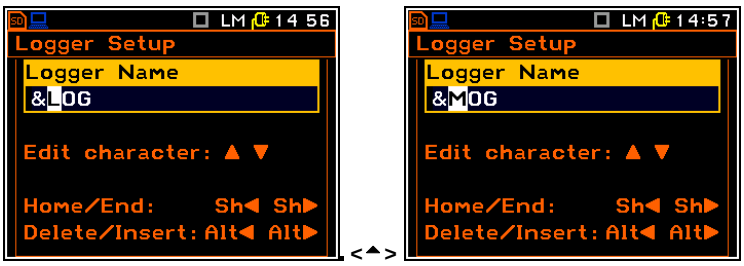
The edition process is presented on the Figures below.

The displayed inversely character may be edited. One can select the position of the character in the edited text using the **<◂>**, **<▸>** push-buttons.



Display during the selection of the character's position to be edited

The available ASCII characters can be changed using the **< ▲ >** or **< ▼ >** push-button. The subsequent digits, underline, big letters and space appear on the display in the inversely displayed position after each pressing of the mentioned above push-buttons.



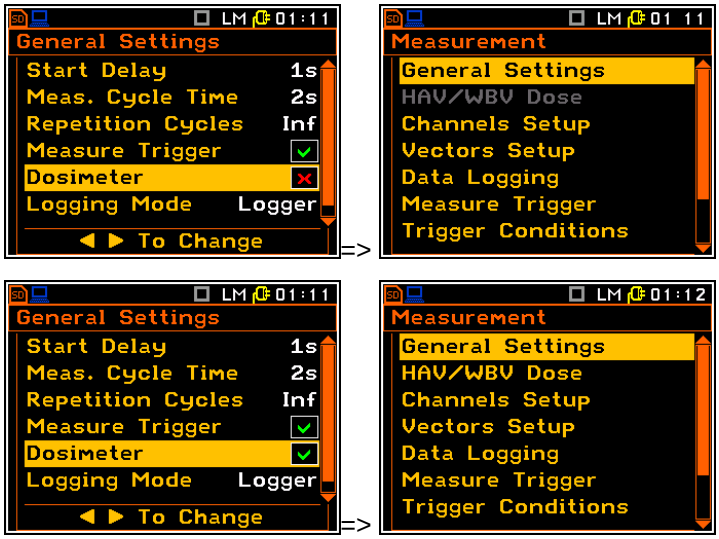
Display during the edition of the file name

One can insert or delete the position in the edited text using the **< ◀ >**, **< ▶ >** push-buttons pressed together with the **<Alt>** one.

Display during the edition of the file name

In the most windows the last line consists the help information. It informs the user how to select or modify the parameter's value, change the character in the text line etc.

If some functions or parameters are not active, the positions in the menu or parameter lists linked with this function or parameter became not active (their colour became grey). For example, if ***Logger*** (*path: <Menu> / Measurement / General Settings / Logging Mode: Off)* is switched off the **Logger** presentation mode is **not** active!



Measurement window when Dosimeter is swithed Off and On

3.2. Powering of the instrument

The **SVAN 106** can be powered by one of the following sources:

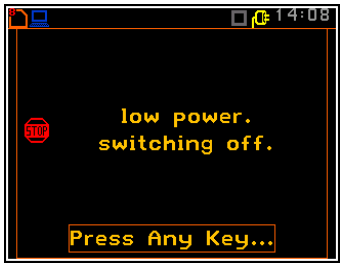
- Four AA standard internal batteries. In the case of alkaline type, fully charged set can operate more than 12 h (6.0 V / 1.6 Ah). Instead of the ordinary, four AA rechargeable batteries can be used (for charging them the separate charger is required). In this case, using the best NiMH type, the operation time can be increased up to 16 h (4.8 V / 2.6 Ah)
- **USB** interface – 500 mA HUB

In the **Power Supply** window of the **Instrument** list one can see the information about the power source.

Battery windows for different sources powering the instrument: batteries and USB power

When the instrument is powered from batteries, the **"Battery"** icon is presented on the top of the display. When voltage of the batteries is too low, the icon is flashing or during attempt of switching on the **Low Battery** message occurs on the display for 2 seconds and the instrument switches off by itself. To change the batteries the user has to switch off the instrument, take off the black bottom cover of the instrument, unscrew battery cover, change the batteries and reassemble the parts of the instrument. The fully charged battery ensures more than 12 hours of the continuous work of the instrument (with the backlight

off). The battery condition can be checked by means of the **Battery** function. It is also presented continuously on the display by means of the **"Battery"** icon.



Display with Low Battery message

When there is a connection to the USB interface (USB Device socket is connected by means of the cable to a PC), the **"Computer"** icon is presented on the top of the display and in the **Battery** window, there is the **USB Power: 0.00V** message.

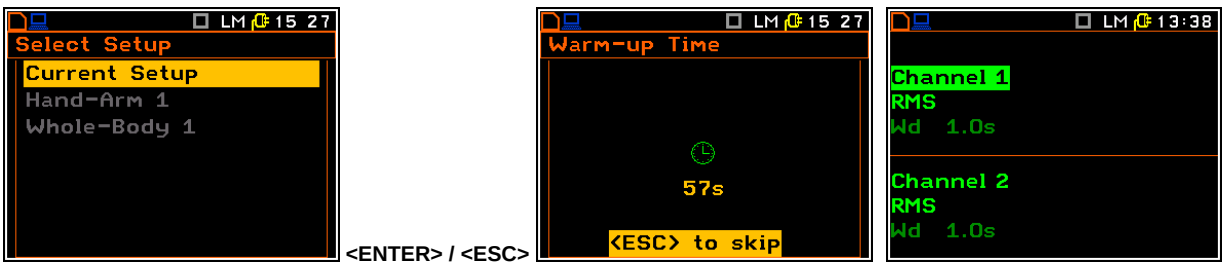
Notice: *In the case when **"Battery"** icon is red, it is strongly recommended to use as soon as possible the external power adapter or USB interface. In the other case the instrument after a while will be switched off automatically!*

The saving of the internal source of the instrument's power can be achieved by means of reducing the brightness of the screen when possible. The settings of **Brightness** and power saver function may be done in the **Screen Setup** window (*path: <Menu> / Display / Screen)*.

3.3. Initial Setup of the instrument

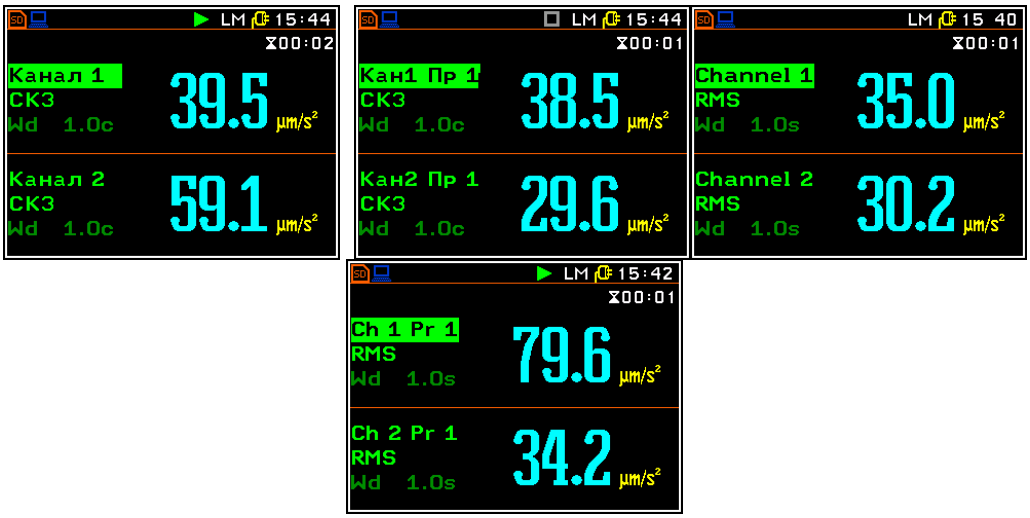
The instrument passes the self-test after switching on (in this time the producer and the name of the instrument is displayed on the display) and then it enters the **Select Setup** window. This window enables one to select predefined setup for specific measurements. To ignore the selection one should press **<Esc>** push-button.

After selection or skip the predefined setup the unit has to warm-up during one minute and then the measurement screen with two results appears.



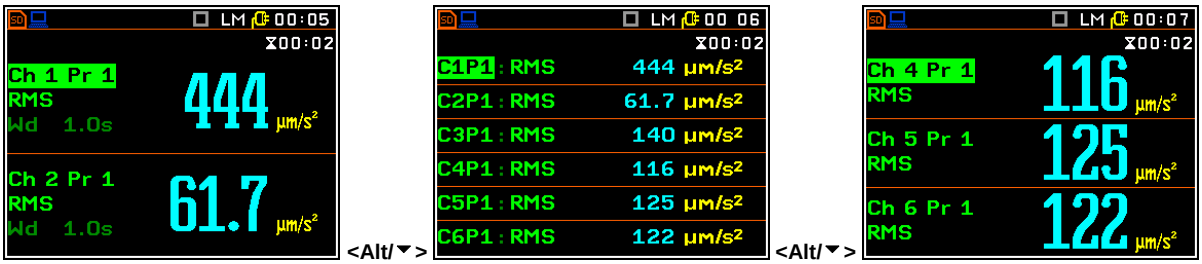
Displays after switching on the instrument

To start the measurements the user has to press the **<Start/Stop>** push-button. The result of the measurement is displayed with the unit of the measurement in so-called two profiles mode.



Displays in two results mode when second profile is swithed Off and On

Two results mode is always available for most Functions of the instrument. The results of the measurements can be also presented in **6 Channels** or **3 Profiles** modes. In these modes the results for six channels or 3 profiles are presented on the screen. The user can switch the presentation modes by means of **<Alt>** and **<▲>**, **<▼>** push-buttons pressed simultaneously.



Displays in two profiles and 6 Channels presentation modes

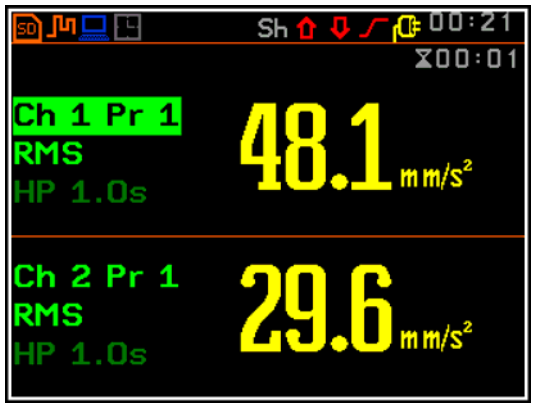
The default settings (set up by the producer) for the profiles of all channels are as follows:

- signal type: **Type: IEPE**;
- weighting filter: **Filter: Wd**;
- type of the RMS detector: **1.0s**;
- dose meter: **1-3 Dosemeter: WBV**; **4-6 Dosemeter: HAV**.

The user can change all mentioned above settings using **Measurement** list. The instrument remembers all changes. The return to the default settings (set up by the producer) is possible after the execution of the **Factory Settings** position available in the **Auxiliary Setup** list.

3.4. Icons description

Additional information about the instrument's state are given by means of the icon's row visible in the top of the display.



Display with available icons

The meanings of the icons are as follows:

	"play" icon is displayed when the instrument is the measurement is started and executed the measurement. .
	"stop" icon is displayed when the measurement is stopped.
	"pause" icon is displayed when the measurement is paused.
	"computer" icon is displayed when there is the USB connection with the PC.
	"curve" icon is presented when the current measurement results are logged in the instrument's logger file.
	"arrow up" icon is displayed when overload appears.
	"arrow down" icon is displayed when underrange appears.
	"tone" icon is displayed during wave recording and event recording.
	"plug" icon is displayed when the instrument is powered from the external source.

	“Internal memory” icon is displayed when internal memory is assigned for file saving.
	“**SD Card**” icon is displayed when external SD card memory is assigned for file saving. Micro SD card is connected.
	“battery” icon is displayed when the instrument is powered from the batteries. Icon corresponds to the batteries state (three, two, one or none vertical bars in side of the icon). When voltage of batteries is too low, the icon became red.
	“clock” icon is displayed when timer is **On**. Is active when the instrument is waiting for the measurement start up. When the measurement start up is close, the icon change its colour to green and stats to blink.
	“Trigger Level +” icon is displayed when the trigger condition is set up to „**Level+**”. The icon appears alternately with the „play” icon.
	“Trigger Level –“ icon is displayed when the trigger condition is set up to „**Level-**”.
	“Trigger Slope +” icon is displayed when the trigger condition is set up to „**Slope+**”.
	“Trigger Slope –“ icon is displayed when the trigger condition is set up to „**Slope-**”
	“Alt” icon is displayed when the **<Alt>** push-button is pressed.
	“Shift” icon is displayed when the **<Shift>** push-button is pressed.

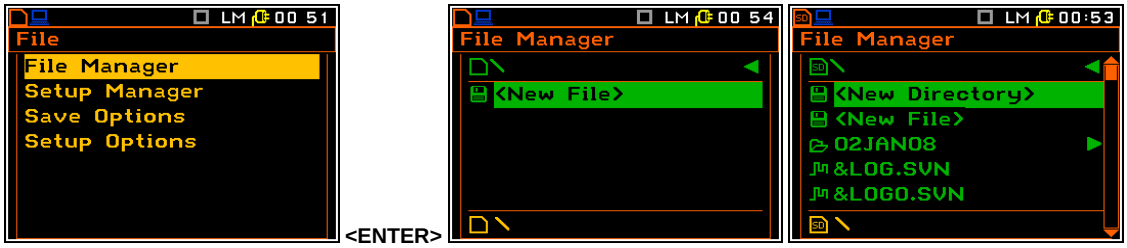
The type of measurement function and the measurement mode (LM, DLM, 1/1 and 1/3 etc.) as well as RTC is also displayed in the same line together with icons.

3.5. Memory organisation

All available measurement results as well as measurement and device settings can be stored in the internal FLASH type memory of the instrument (16 MB) or in the external Memory (**SD Card**). Logger, wave and event results can be save only in the external Memory.

The **SD Card** external memory is activated automatically after insertion of the card. The **SD Card** memory is organised as standard memory with directories and sub-directories. It is possible to create and to delete the directory.

The content of each memory type can be checked with the help of the **File Manager** or **Setup Manager** function of the **File** menu.



Checking the content of the memory

To change the memory type one should press the **<◄>** push-button in the **File Manager** window, select the memory type by means of the **<▲>**, **<▼>** push-buttons and press the **<►>** one.

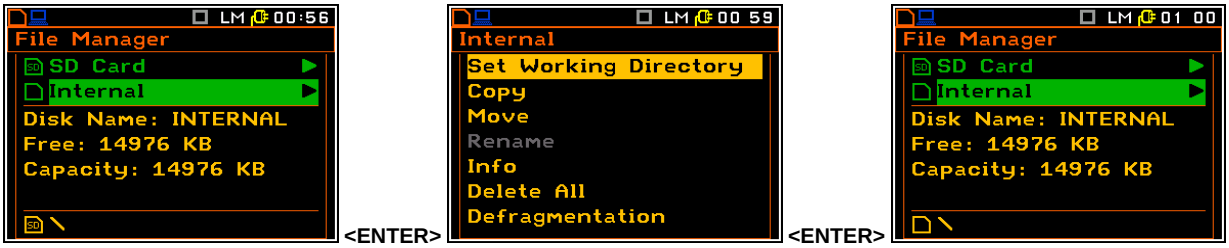
Changing the memory type for checking the content

The file are saved in the Memory and in the catalogue which was set up as a working. The working Memory type is displayed as the icon in the left position of the icon line.

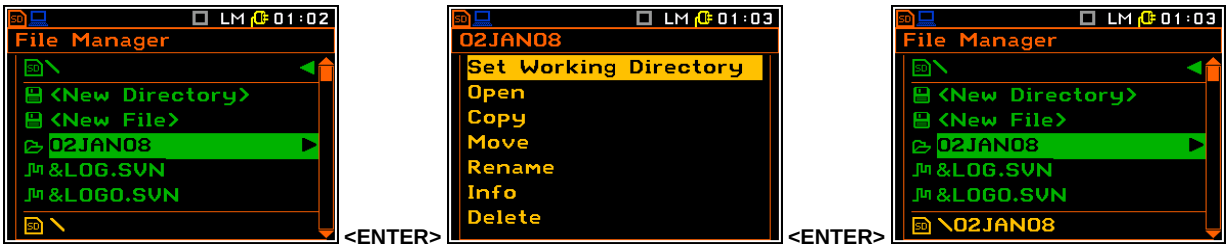
	"Internal" memory icon is displayed when internal memory is assigned for file saving.
	"SD Card" icon is displayed when external SD card memory is assigned for file saving. Micro SD card is connected.

The working directory is described in the bottom line of the **File Manager** window.

To change the working directory and/or working memory one should select the Memory type and in case of **SD Card** the desired directory and press the **<ENTER>** push-button. After the new window is opening one should select the **Set Working Directory** position and press the **<ENTER>** push-button again. The icon on the upper line and the directory path on the bottom line will be changed accordingly. Same algorithm is applied for directory changing for **SD Card** memory.



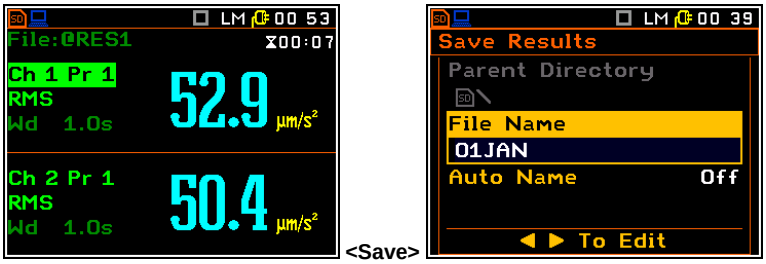
Setting the internal memory as working memory



Setting the new directory as working one

There are two options for storing result data in the internal or external memory. One option is to press **<Save>** push-button right after the measurement performance. Another option is to create **<New File>** in the **File Manager**.

After pressing the **<Save>** push-button the **Save Results** window appears.



Save Results window opening

In the **Save Results** window the user can give the name for the result file, or to choose automatic name generation option: **Auto Name: Number**, which saves a file with the name increased by one. The **Auto Name: Off** function saves a file with the edited name. These functions can be selected by means of the **<◀>**, **<▶>** push-buttons. The Setup files can be stored also by means of **<S/P>** push-button and creating the **<New File>** in the **Setup Manager** list.

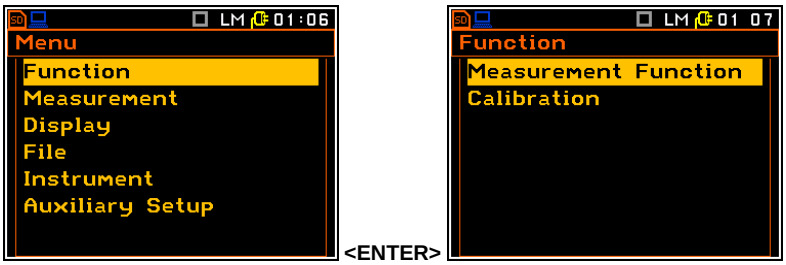
The Setup files can be stored also by means of **<S/P>** push-button and creating the **<New File>** in the **Setup Manager** list.

The logger, wave and event files are created automatically in the assigned directory on the external memory drive.

The user can copy or move data from the internal memory of the device and store new data in the external memory.

4 FUNCTIONS OF THE INSTRUMENT – Function

In order to select the **Function** list one has to press the **<Menu>** push-button, select the **Function** text and press **<ENTER>**. The **Function** list contains two elements: **Measurement Function** and **Calibration**.



Function window; Measurement Function selection

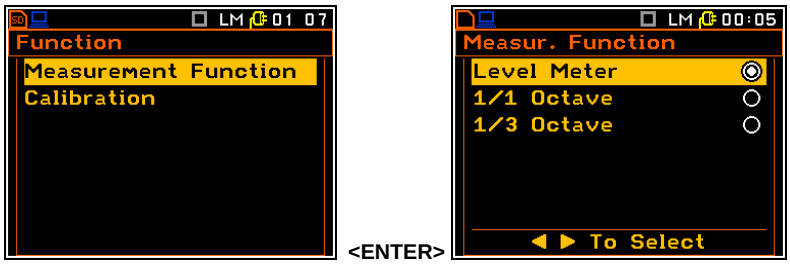
4.1. Measurement functions of the instrument - Measurement Function

The main function of the instrument is the measurement of Vibration level (**Level Meter**) meeting the ISO 8041:2005 standard. The instrument can also be used for the long-term vibration monitoring using for this purpose the huge logger, in which the measurement results are stored.

The user may also use 1/1 and 1/3 octave analysis functions. These functions broaden the main Level Meter functions of the instrument, because 1/1 and 1/3 analysis is performed together with all calculations of Level Meter functions.

In all functions it is possible to perform additionally dose measurements. Dose parameters are setting up in **HAV/WBV Dose** window (path: <Menu>/ Measurement).

In order to select the required function the user has to enter the **Measurement Function** list. After entering the **Measurement Function** list, the set of the available functions appears on the display: **Level Meter**. Currently active function is marked.



Measurement Function window

The type of measurement function and the measurement mode is displayed at the upper line of the screen:

- ***LM*** ***Level Meter***,
- ***1/1*** ***1/1 Octave***,
- ***1/3*** ***1/3 Octave***,

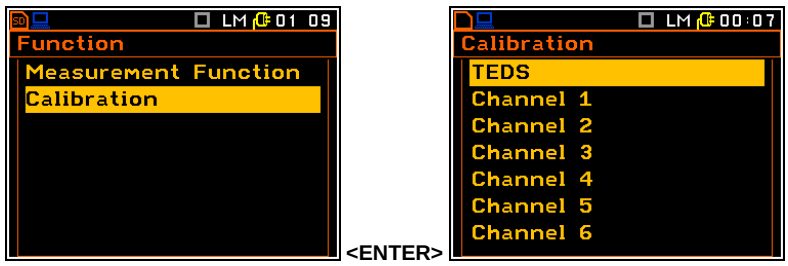
Optional functions that broadening the applications of the instrument can be install. These options can be supported by the producer or purchased later.

Note: *It is not possible to change the measurement function during the measurements. The instrument displays in this case for about 3 seconds the text:* ***"Measurement in Progress"****. In order to change the mode of the instrument the measurement must be finished!*

4.2. Instrument's calibration – Calibration

The instrument is factory calibrated with the supplied accelerometers. In case of using other transducers the calibration of the measurement channels has to be done. Periodic calibration of standard accelerometers is also required. In order to select a calibration function the user has to enter the **Calibration** sub-list.

The **Calibration** list consists of six positions: **Channel 1**, **Channel 2** … **Channel 6** which are used to perform the calibration of each channel of the unit.

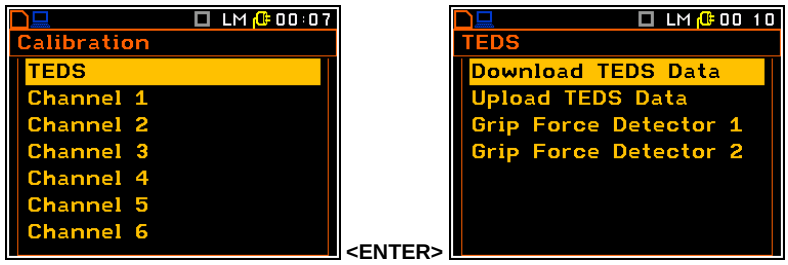


Calibration list opening

4.3.1. Downloading and uploading TEDS data – TEDS

If accelerometer with new TEDS system is connected before switching the instrument on the TEDS data are downloading automatically. TEDS data usually include: serial number, producer name, calibration factor, etc.

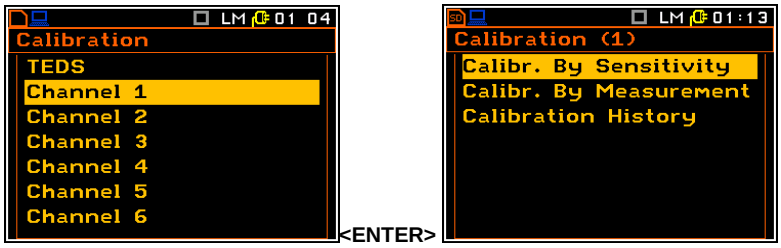
The **TEDS** position enables the user to **Download TEDS Data**, when accelerometer is connected during instrument's working session. It enables also to **Upload TEDS Data** from the instrument to the accelerometer's TEDS memory - calibration results, performed by user.



Instrument list; the TEDS window opening

4.3.2. Calibration of the instrument channels – Channel x

The **Channel x** sub-list consists of three positions: **Calibr. By Sensitivity**, **Calibr. By Measurement**, which are used to perform the calibration and **Calibration History** used for checking the parameters of the previous calibrations.



Channel calibration menu opening

Note: *The calibration factor is always added to the results in the* ***Level Meter***, ***1/1 Octave***, ***1/3 Octave***, ***FFT*** *and other modes.*

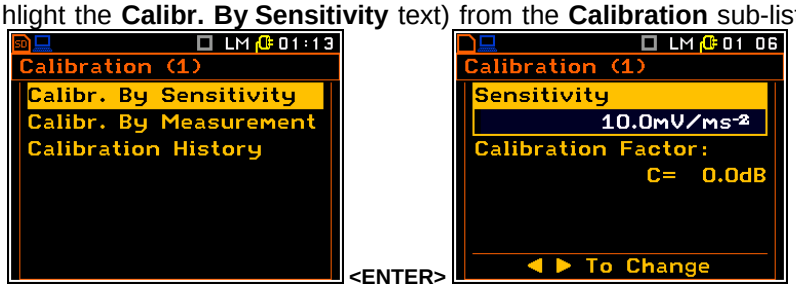
Note: *The calibration level and the calibration result is expressed in different units depending on the settings of the instrument. The metric or non-metric Vibration units are set in the* ***Vibration Units*** *(path: Menu / Auxiliary Setup / Vibration Units). Additionally, the* ***Linear*** *or* ***Logarithm*** *units are set in the* ***Display Scale*** *(path: Menu / Display / Results Scale).*

Note*: It is not possible to calibrate the instrument during the execution of the measurements. It is possible to open different lists and sub-lists but the positions in these lists are not displayed inversely and so - not accessible. The "play" icon indicates that the instrument is in the measurement process. In order to change the sensitivity the measurement must be finished!*

4.3.3. Calibration by transducer's sensitivity – Calibr. By Sensitivity

The calibration by the accelerometer's sensitivity introduction can be done in the following way:

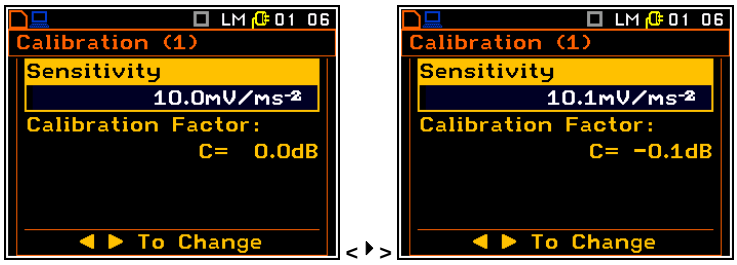
1. Select this type of the calibration (highlight the **Calibr. By Sensitivity** text) from the **Calibration** sub-list and press the **<ENTER>** push-button.



Selection of the Calibr. By Sensitivity calibration mode

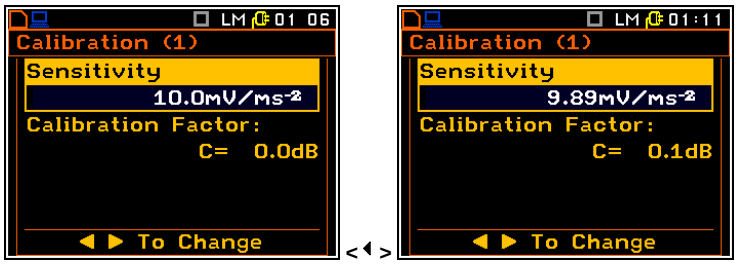
2. Set the sensitivity of the accelerometer taken from its calibration certificate using the **< ◀ >, < ▶ >** push-buttons (or combination of the **<Shift>** and **< ◀ >, < ▶ >** push-buttons).

The calibration factor is calculated, after pressing the **< ◀ >, < ▶ >** push-buttons, in the relation to 10.0 mV / ms^{-2}. For the sensitivity of the accelerometer higher than 10.0 mV / ms^{-2} the calibration factor is negative.



Setting the sensitivity higher than 10.0 mV / ms^{-2}

For the sensitivity of the accelerometer lower than 10.0 mV / ms^{-2} the calibration factor is positive.



Setting the sensitivity lower than 10.0 mV / ms^{-2}

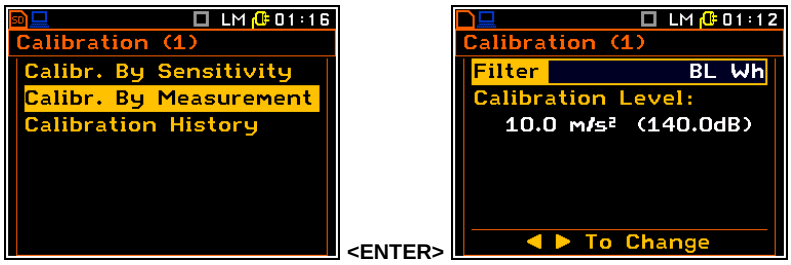
The lowest applicable value of the sensitivity to be introduced is equal to 10.0 μV / ms^{-2} (it conforms to the calibration factor equal to 60.0 dB) and the highest one – 10.0 V / ms^{-2} (calibration factor equal to -60.0 dB).

In order to save the selected calibration factor the user has to press **<ENTER>**. In order to return to the **Calibration** sub-list the user has to press the **<ESC>** push-button.

4.3.4. Calibration by measurement – Calibr. By Measurement

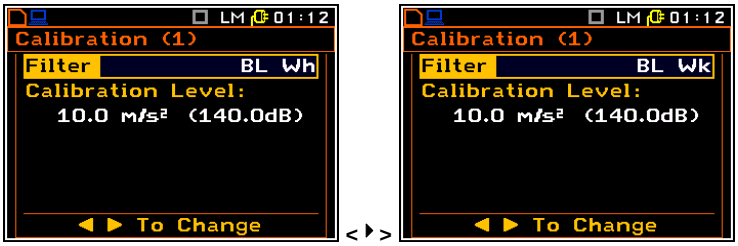
The calibration by measurements can be done in the following way:

1. Select the calibration by measurement (highlight the **Calibr. By Measurement** text) from the **Calibration** sub-list and press the **<ENTER>** push-button.



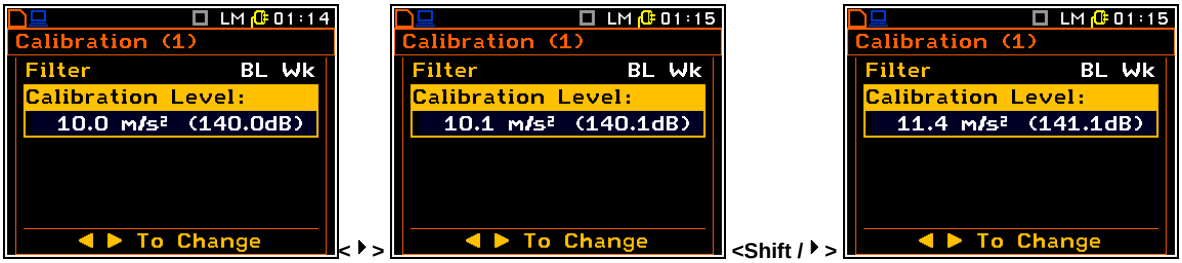
Selection of the Calibr. By Measurement calibration mode

2. Select filter: for whole-body transducer - BL Wk or equivalent, for hand-arm transducer – BL Wh.



Filter selection

3. Select the calibrator signal level.



Selection the calibration level

4. Attach the vibration calibrator to the instrument's accelerometer.

5. Switch on the calibrator and wait approximately 30 seconds before starting the calibration measurement.

6. Start the calibration measurement by pressing the **<Start/Stop>** push-button.

The measurement starts after 5 seconds delay. The measurement time is also predefined to 5 seconds. During the calibration period, the **<ESC>** and **<Pause>** push-buttons do not operate but it is possible to stop the measurement using the **<Start/Stop>** push-button. Waiting for the calibration measurement to begin, a **Start Delay** is counted down. At the end of the measurement, the result is displayed on the display in the bottom line.

Displays during the calibration measurement

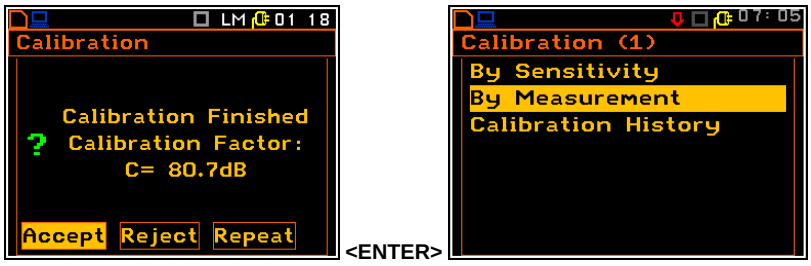
The calibration procedure should be repeated a few times to ensure the integrity of the calibration. The obtained results should be almost identical (with ±0.1 dB difference). The reasons for unstable results are as follows:

- the calibrator is not properly attached to the instrument,
- there are external disturbances,
- the calibrator or the measurement channel (the accelerometer or the instrument itself) are damaged.

Note: *During the calibration period, external disturbances (vibrations or acoustic noise) should not exceed 100 dB.*

7. Press the **<ENTER>** push-button in order to accept the measurement result.

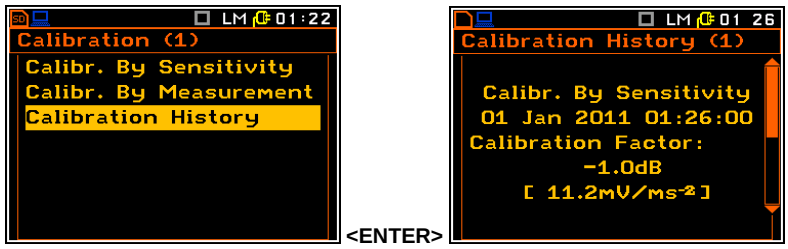
The calibration factor is calculated, stored and displayed after pressing the **<ENTER>** push-button.



Acceptance of the calibration factor value

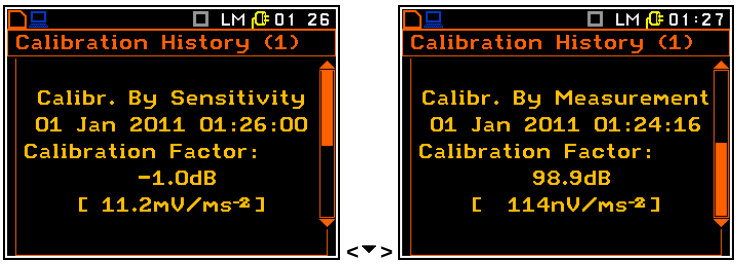
4.3.5. History of the calibrations – Calibration History

The **Calibration History** window displays up to ten last calibration records.



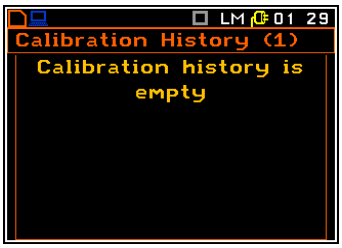
Opening the Last Calibration window with calibration records

In order to review all calibration record, the user has to use the **<▲>**, **<▼>** push-buttons. The opened window contains the date and time of the performed calibration measurement, the way the calibration was done (**Calibr. By Measurement** or **Calibr. By Sensitivity**) and the obtained calibration factor (**Calibration Factor**).



Calibration records review

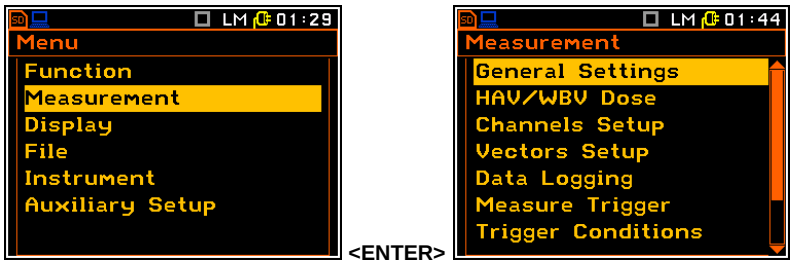
In the case when the calibration measurements were not performed, the **Calibration History** window does not contain any record. The contents of this window is cleared after the **Factory Settings** operation.



Display with the empty calibration records

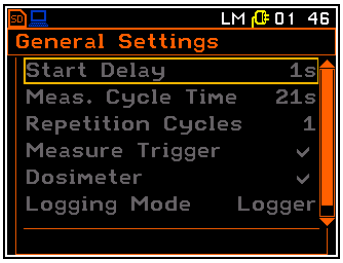
5 MEASUREMENT PARAMETERS SETTING – Measurement

The **Measurement** list contains the elements, which enable one to programme the measurement parameters for all channels and profiles. The **Measurement** list appears after pressing the **<Menu>** push-button, selecting the **Measurement** text and pressing **<ENTER>**.



Main list; Measurement window opening

Notice: *Any parameter in the* ***Measurement*** *list can be changed only when the instrument does not execute a measurement. The parameters are displayed with different colour and any marker movement is impossible. The blinking "play" icon indicates that the instrument is performing the measurements.*

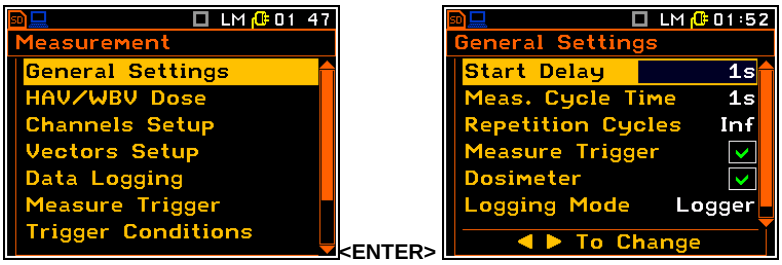


Display with not active parameters of Measurement list during measurement

Notice: *The parameters can be presented in* ***Logarithm*** *(decibels) or* ***Linear*** *(m/s^2) units. It depends on the* ***Scale*** *position value (path: Menu / Display / Results Scale), e.g. 10 m/s^2 can be presented as 140 dB.*

5.1 Selection of measurement parameters - General Settings

The **General Settings** list is opening from the **Measurement** list.

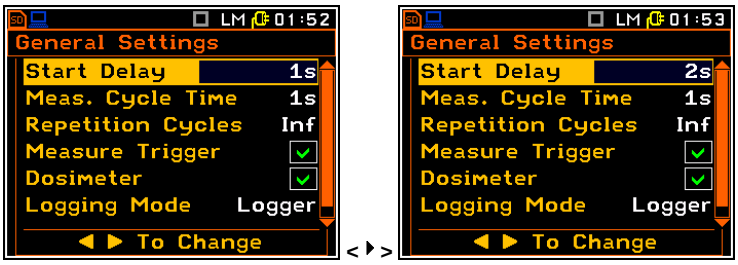


Displays with the General Settings list

The **General Settings** list consists of the following parameters: the delay of the start of measurements (**Start Delay**), the integration period (**Meas. Cycle Time**) and the repetition of the measurement cycles (**Repetition Cycles**).

Setting time delay before the start of measurements - **Start Delay**

The **Start Delay** defines the delay period from the **<Start/Stop>** push-button pressing to the start of the measurements (the digital filters of the instrument analyse constantly the input signal even when the measurements are stopped). This delay period can be set from **0 second** to **60 seconds** (with 1 second step by means of the **< ◀ >**, **< ▶ >** push-buttons and with 10 seconds step with the **< ◀ >**, **< ▶ >** push-buttons pressed together with the **<Shift>** one. The **<ENTER>** push-button must be pressed for the confirmation of the selection, which closes simultaneously the **General Settings** window.



General Settings windows; the setting of the Start Delay

Notice: *The minimum delay period is equal to 0 second. In the* ***Calibration*** *mode, the delay period is equal to 5 seconds.*

Setting the integration period – **Meas. Cycle Time**

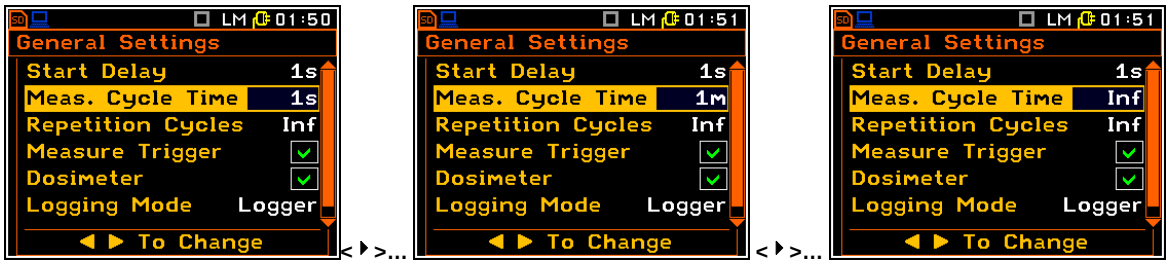
The **Meas. Cycle Time** defines the period in which the signal is being averaged during the measurements. The definitions of the measurement results in which the integration period is used is given in App. D. The required value of this parameter can be set in the range of:

- from **1 s** to **59 s** (with **1 second** or **10 seconds** step),

  from **1 m** (min) to **59 m** (with **1 minute** or **10 minutes** step),

- from **1 h** to **24 h** (with **1 hour** or **10 hours** step).

It is also possible to set **Inf** value. The **Inf** value denotes the infinite integration of the measurements (until the pressing the **<Start/Stop>** push-button or after receiving the remote control code).



General Settings windows; Integration Period selection

Additionally, the predefined periods: **1 m**, **5 m**, **15 m**, **1 h**, **8 h**, **24 h** and **Inf**, which are enumerated in the standards, are also available (by pressing the **< >** push-button or **< >** with **<Shift>**; these values are placed in the mentioned above sequence on the left in relation to **1 s**).

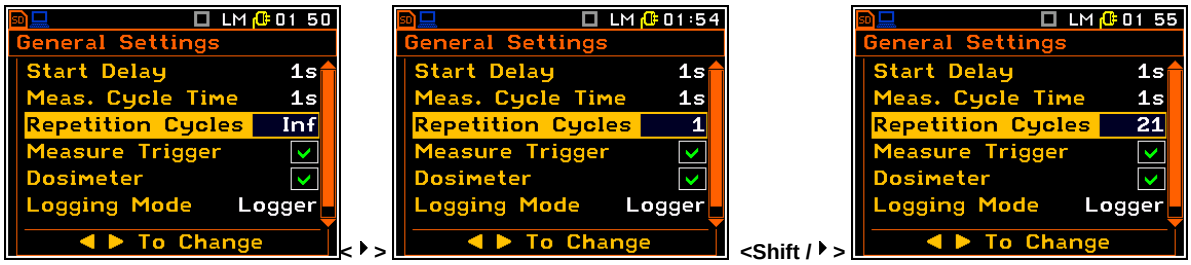
Notice: *In the case of switching on the* ***Auto Save*** *function, the minimum value of the integration period should be equal to 10 seconds.*

If the user wants to switch on **Auto Save** option *(path: Menu / File / Save Options)* the integration period value has to be greater or equal than 10 seconds. When **Auto Save** option was switched on and new entered integration period value is less than 10 seconds **Auto Save** option switches off and **Integration Period Too Short / Autosave Not Available** message appears on the display.

Display, when the Integration Period is too short for Auto Save option

Setting the number of repetition of measurement cycles – **Repetition Cycles**

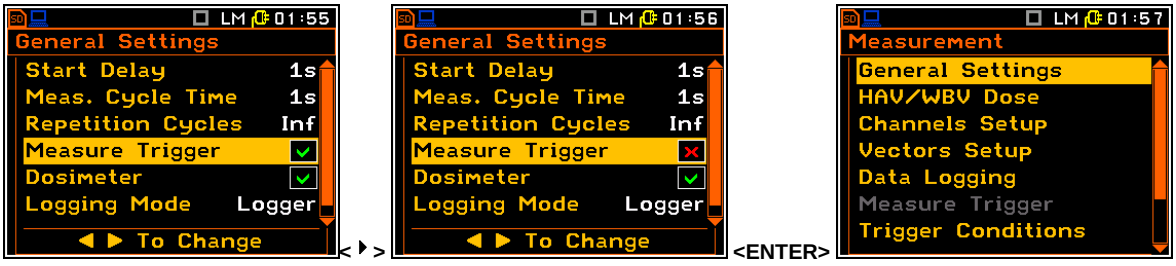
The **Repetition Cycles** defines the number of cycles (with the measurement period defined in the **Meas. Cycle Time**), which should be performed by the instrument. The **Repetition Cycles** values are within the limits [1, 1000].



Repetition Cycles selection

Activation of the measure trigger – **Measure Trigger**

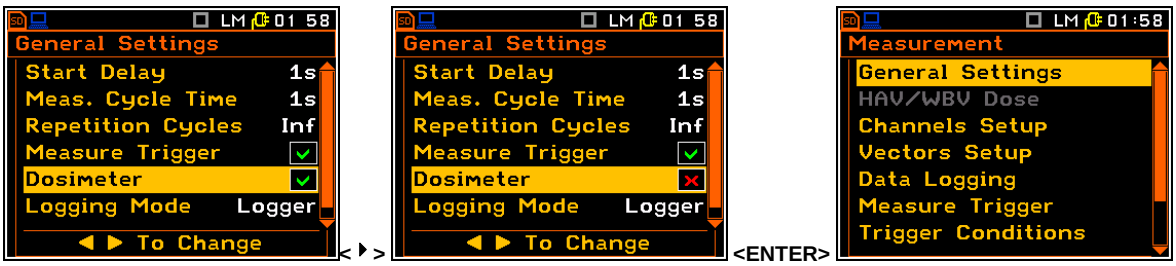
The **Measure Trigger** position activates or deactivates the measure trigger function. If the **Measure Trigger** function is swithed off, then the **Measure Trigger** position in the **Measurement** list will be not active.



Measure trigger activation

Activation of the dose meter function – **Dosimeter**

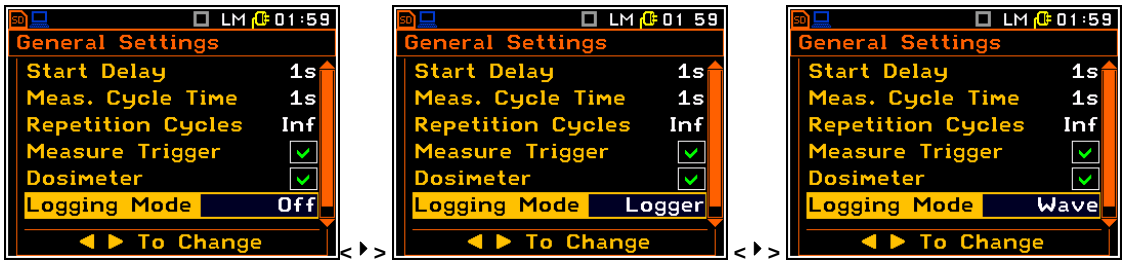
The **Dosimeter** position activates or deactivates the dose meter function. If the **Dosimeter** function is swithed on, then all channels will be assigned for whole-body or hand-arm dose measurement. Dosimeter parameters can be setup in the **HAV/WBV Dose** window, opened from the **Measurement** list. If the **Dosimeter** function is swithed off, then the **HAV/WBV Dose** position in the **Measurement** list will be not active.



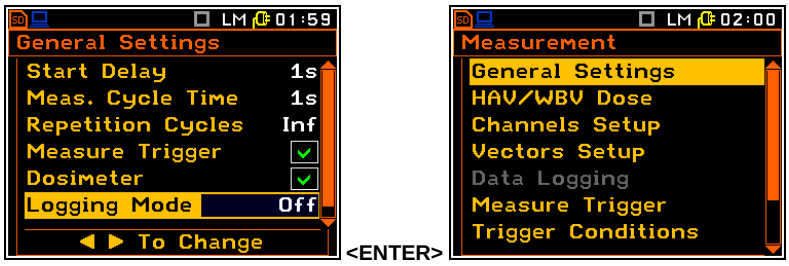
Dosimeter function deactivation

Setting the Logger mode – **Logger Mode**

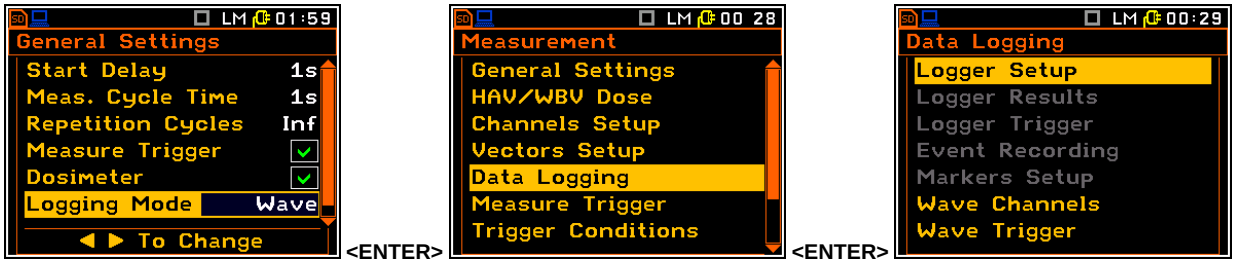
The **Logger Mode** position enables one to deactivate the logger function (**Off**) or to activate this function by choosing the logger mode (**Logger** or **Wave**). In case the **Logger** was selected the history of results are saved in the special file, defined in the **Logger Setup** window. If **Wave** was selected the wave signals for selected in the window **Wave Channels** channels are recording in the file with the predefined name **&REC#.WAV**. Depending on what parameter of **Logger Mode** was choosen some positions in the **Measurement** and **Data Logging** lists are not active.



Logger Mode parameter selection



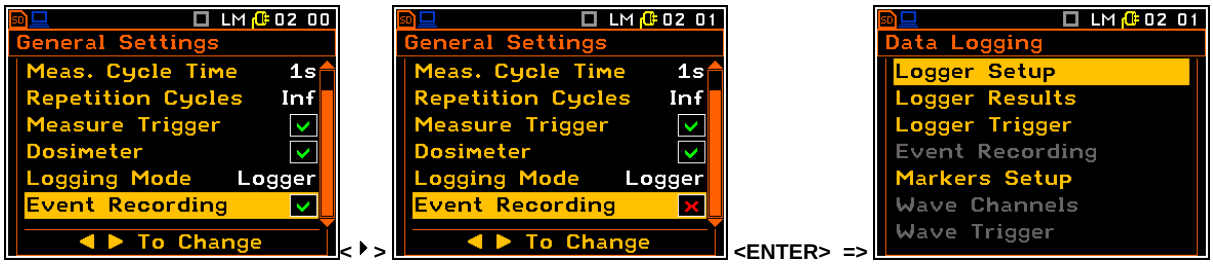
Measurement screen after Logger swithed off



Data Logging screen when Wave mode is switched on

Activation of the event recording function – **Event Recording**

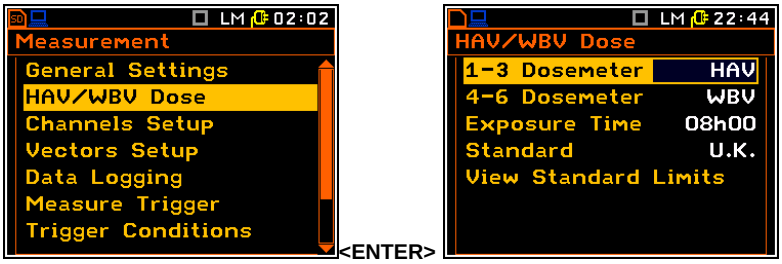
The **Event Recording** position enables one to activate the event recording function. If the **Event Recording** function is swithed off, then the **Event Recording** position in the **Data Logging** list will be not active.



Event recording activation

5.2 Setting the parameters for dose measurements – HAV/WBV Dose

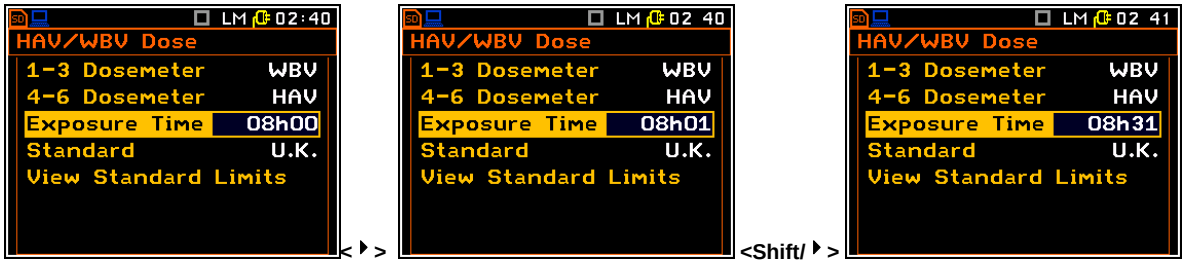
The **HAV/WBV Dose** list is opening from the **Measurement** list. This list enables one to set up the parameters for dose measurements, like: exposition period, type of measurement (whole body or hand arm), performed in channels 1-3 and 4-6, used limits for some standards (**U.K.**, **Italy**, **Poland**, **France** and **Germany**), as well as limits, defined by the user (**User**).



HAV/WBV Dose list opening

Setting the exposure time – **Exposure Time**

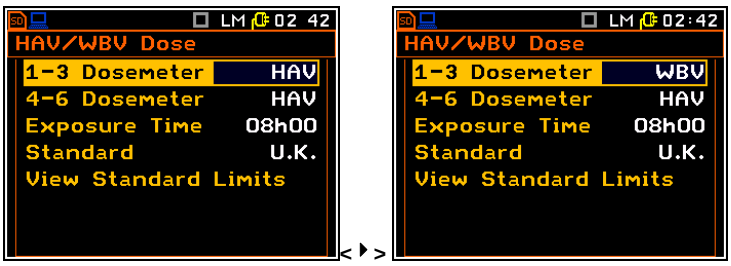
The **Exposure Time** enables the user to set the desired value of the exposure time that is used for the calculation **HAV/WBV Dose** results. The **Exposure Time** values are within the range [**00h01**, **24h00**].



HAV/WBV Dose window; Exposure Time selection

Setting the measurement type for channels 1-3 and 4-6 – **1-3 Dosemeter** & **4-6 Dosemeter**

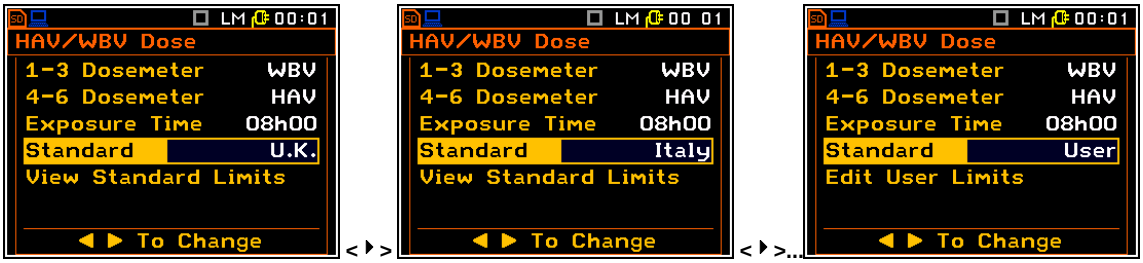
Positions **1-3 Dosemeter** and **4-6 Dosemeter** enable the user to set the desired type of the measurement, performed with the use of channels 1,2,3 and 4,5,6 – hand-arm (**HAV**) or whole-body (**WBV**) vibration. Dose measurements may be also switched off (**Off**).



HAV/WBV Dose window; dosemeter type selection

Setting the standard for dose measurements – **Standard**

The **Standard** position enables the user to set the standards for the measurements of the **HAV/WBV Dose**. The available values of this position are **U.K.**, **Italy**, **Poland**, **France**, **Germany** and **User**.

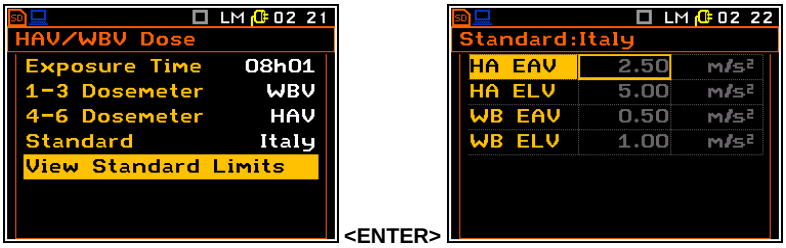


HAV/WBV Dose window; Standard selection

Depending of settings in the position **Standard** it is possible to view (**U.K.**, **Italy**, **Poland**, **French**, **Germany**) or edit (**User**) limits for dose calculation.

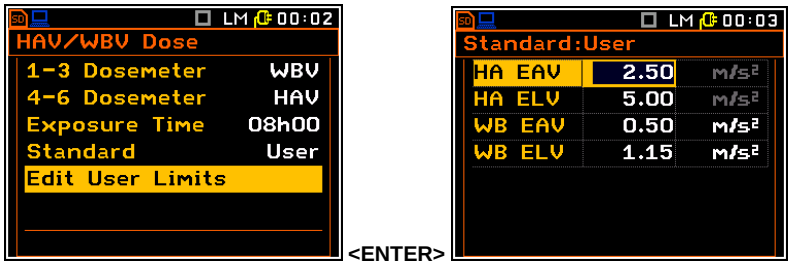
View or edition of the limits for dose calculation – **View Standard Limits / Edit User Limits**

The **View Standard Limits** position opens the window with the coefficients for the selected standard.



View Standard Limits window opening

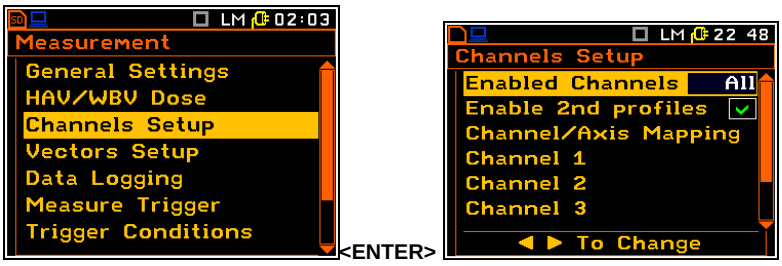
When the **User** is selected in the **Standard** position then the **Edit User Limits** position appears on the screen where the user can set up its own coefficients.



HAV/WBV Dose window; Standard: User window opening

5.3 Setting parameters in a channels – Channels Setup

The **Channel x** position enables the user to assign the axis of three-axial accelerometer for the specific channels, switch on or off channels or second profiles, and to program the channels parameters as: transducer type (**Type**) and weighting filter (**Filter**). The measurement range cannot be changed and is displayed only for information purpose. The **Channels Setup** list is opened from the **Measurement** list.



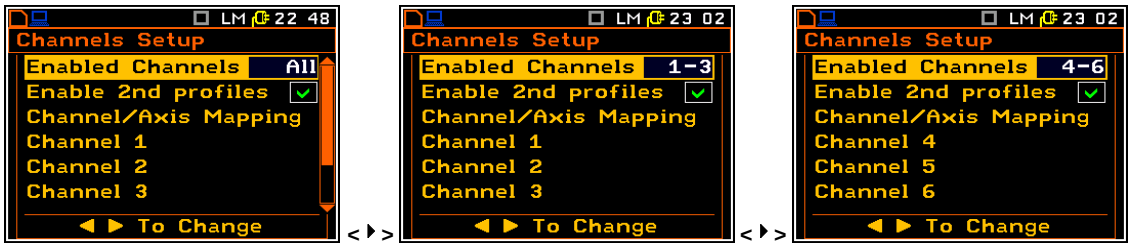
Channels Setup list opening

Notice: *The change of the profile parameters is not possible when the measurement is performed. The user has to finish the current measurement.*

Activation of channels and second profiles **- Enabled Channels**

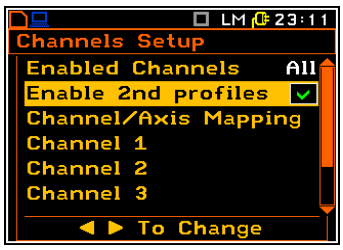
The first two positions enable one to switch on or off some channels and the second profile from the calculation process.

In the **Enabled Channels** the user may select **All**, **1-3** or **4-6** channels to be active during measurement. Other channels will be disabled and will not be displayed.



Channels activation

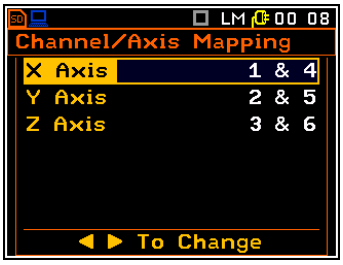
In the **Enabled 2nd profiles** the user may switch on or off the second profile. If second profiles will be switched off, they will not be displayed.



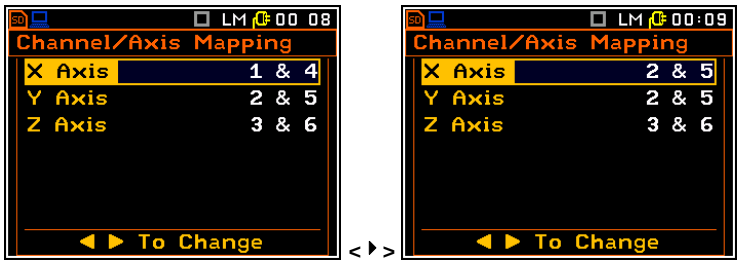
Second profiles activation

5.3.1 Assignment channels for the accelerometer axis - Channel/Axis Mapping

The **Channel/Axis Mapping** position enables one to assign channels to the transducer's axis. The user can assign to one axis only pair of channels like **1&4**, **2&5**, **3&6**. If same pairs are assigned to the different axis there will be error detected and the user will be proposed to reassign the channels.



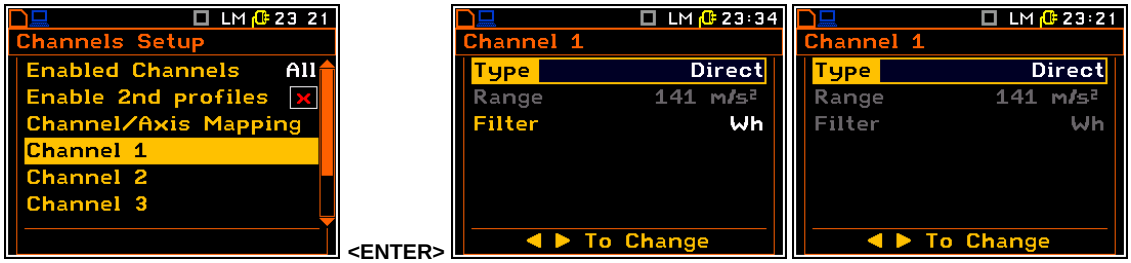
Channel/Axis Mapping window opening



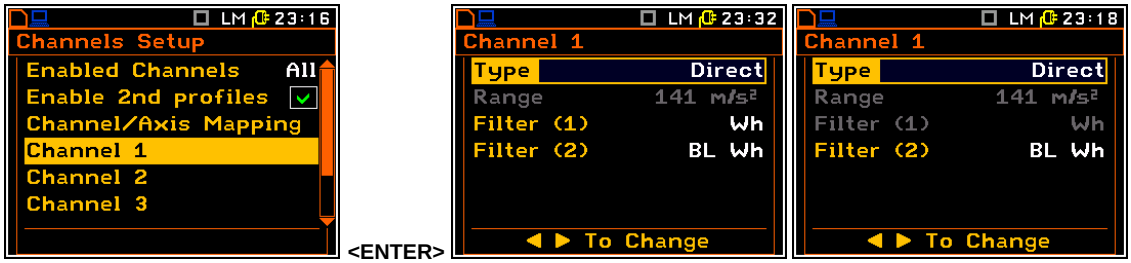
Channel/Axis Mapping;

5.3.2 Setting parameters for channels – Channel x

The **Channel x** positions enable one to set up or display parameters for the individual channel, like input type and filters for profiles.



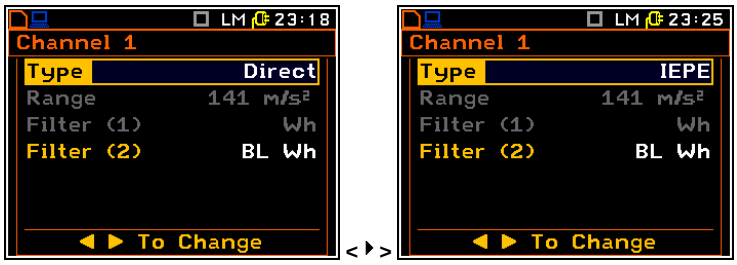
Channel x window in case of disabled second profiles while Dosemeter is Off and On



Channel x window in case of active second profiles while Dosemeter is Off and On

Input type selection - **Type**

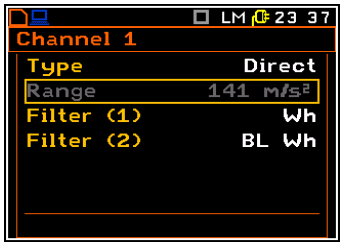
The following inputs are available: **IEPE** and **Direct**.



Selection of the input type for the Cnannel 1

Range selection - **Range**

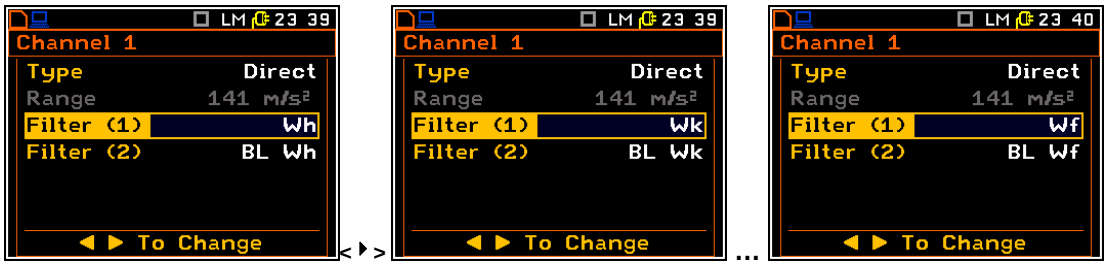
The **Range** value cannot be changed; it is always equal to **141 m/s^2**. .



Selection of the Range position

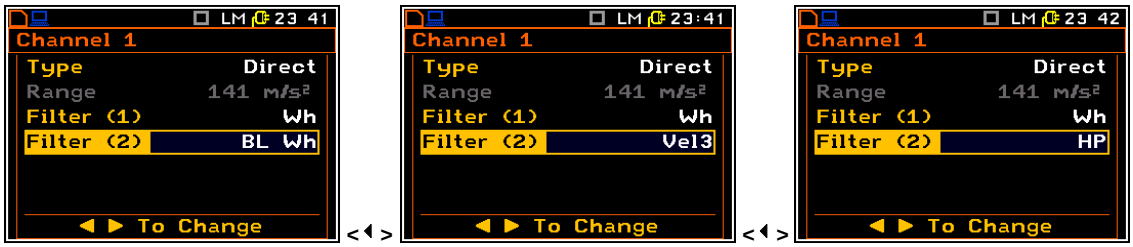
Weighting filter selection – **Filter**

The following weighting filters are available for the first profile of the instrument: **Wh**, **Wk**, **Wd**, **Wc**, **Wj**, **Wm**, **Wg**, **Wb** and **Wf**.



Selection of the weighting filter for profile 1

The set of filters for the profile two is depending of the filter selected for profile one. There is always available filter **HP**. Second available filter for profile 2 is one of: **BL Wh**, **BL Wk**, **BL Wd**, **BL Wc**, **BL Wj**, **BL Wm**, **BL Wg**, **BL Wb** and **BL Wf**; according to the rule – if **Wb** filter is selected in the profile 1 then the apart of **HP** only **BL Wh**, filter is available for profile 2. If **Wk** filter is selected in the profile 1 then the apart of **HP** only **BL Wk**, filter is available or profile 2. And so on.



Selection of the weighting filter for profile 2

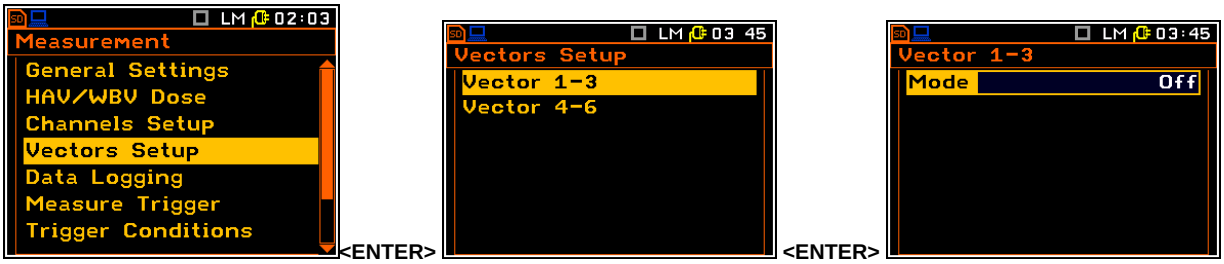
The characteristics of the filters are given in App. D.

RMS detector

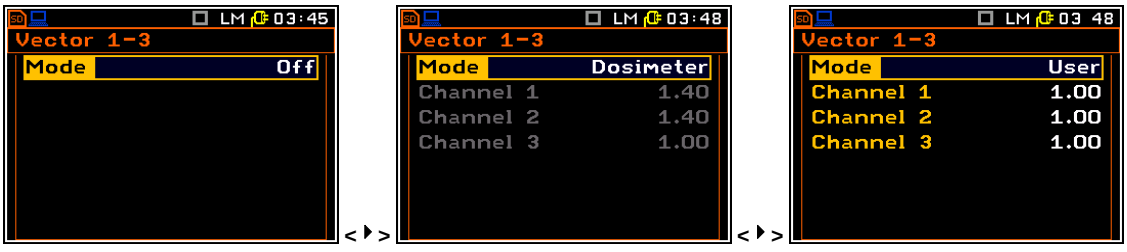
In the instrument the **only one 1.0s** RMS detectors is available.

5.4 Setting the vector calculations – Vector Setup

The **Vector Setup** position enables the user to select the coefficients to calculate the vector for channels 1, 2, 3 and 4, 5, 6. There are two options for vector calculation – with the use of standard coefficients (**Dosimeter**) and with defined coefficients (**User**, **MTVV** and **PPV (2)**).

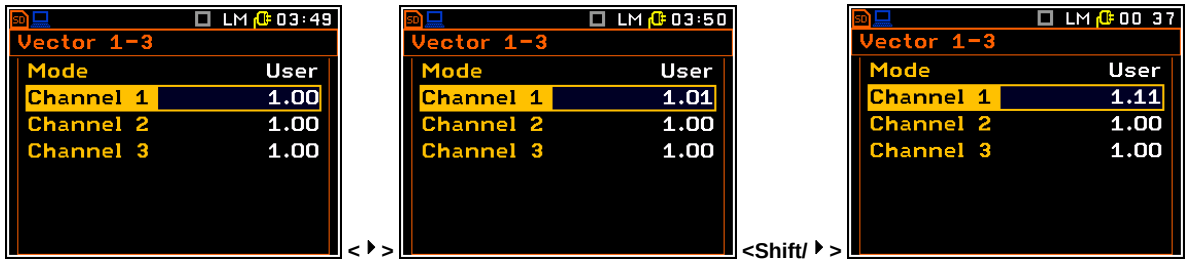


Vector 1-3 window opening



Vector 1-3 window; Mode selection

When the user needs to calculate vector with other than standard coefficients, it is possible to select the coefficient within the values from **0.00** to **2.00**.



Vector 1-3 window; coefficients for channels selection

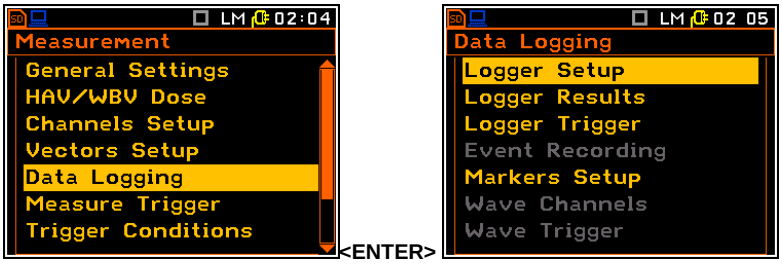
The values presented above are taken into account during the calculations of the measurement results. **VECTOR** is calculated according to the formulae:

$$VECTOR = \sqrt{k_1^2 x_1^2 + k_2^2 x_2^2 + k_3^2 x_3^2}$$

Where k_1, k_2 and k_3 are the coefficients and x_1, x_2 and x_3 are RMS results for different channels. It is important that the user should choose only coefficients corresponding with the proper channels.

5.5 Setting of the logging functionality – Logging

The **Data Logging** list enables one to program the logger functions. It is opening from the **Measurement** list.

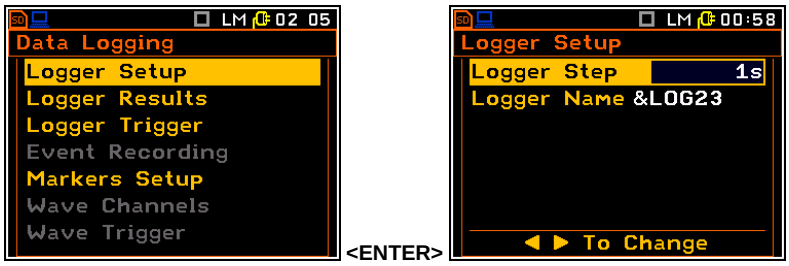


Logging window opening

The **Data Logging** list consists of seven positions. First three positions: **Logger Setup**, **Logger Results** and **Logger Trigger** enable one to program the results history saving. The **Event Recording** and **Markers Setup** positions enable one to program recordings and identification of events, occurred during whole measurements cycles, while logging data to the logger file. The **Wave Channels** and **Wave Trigger** positions enable one to program the parameters of signal (wave) recording.

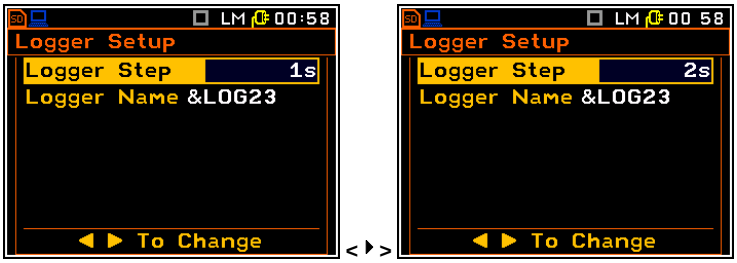
5.5.1 Data logger programming – Logger Setup

The **Logger Setup** list enables the user to edit the name of the logger file and to set the logger step.



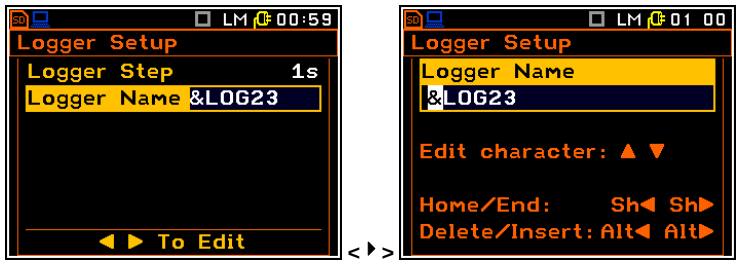
Logger Setup list opening

The **Logger Step** defines the interval of the data logging in a file. It can be set from 100 milliseconds to 1 hour.



Logger Step settings

The **Logger Name** enables the user to name the logger file. The default one is **LOG**. The name cannot be longer than eight characters. After pressing the **< ◂ >**, **< ▸ >** push-buttons, the special window with text editor function is opening.



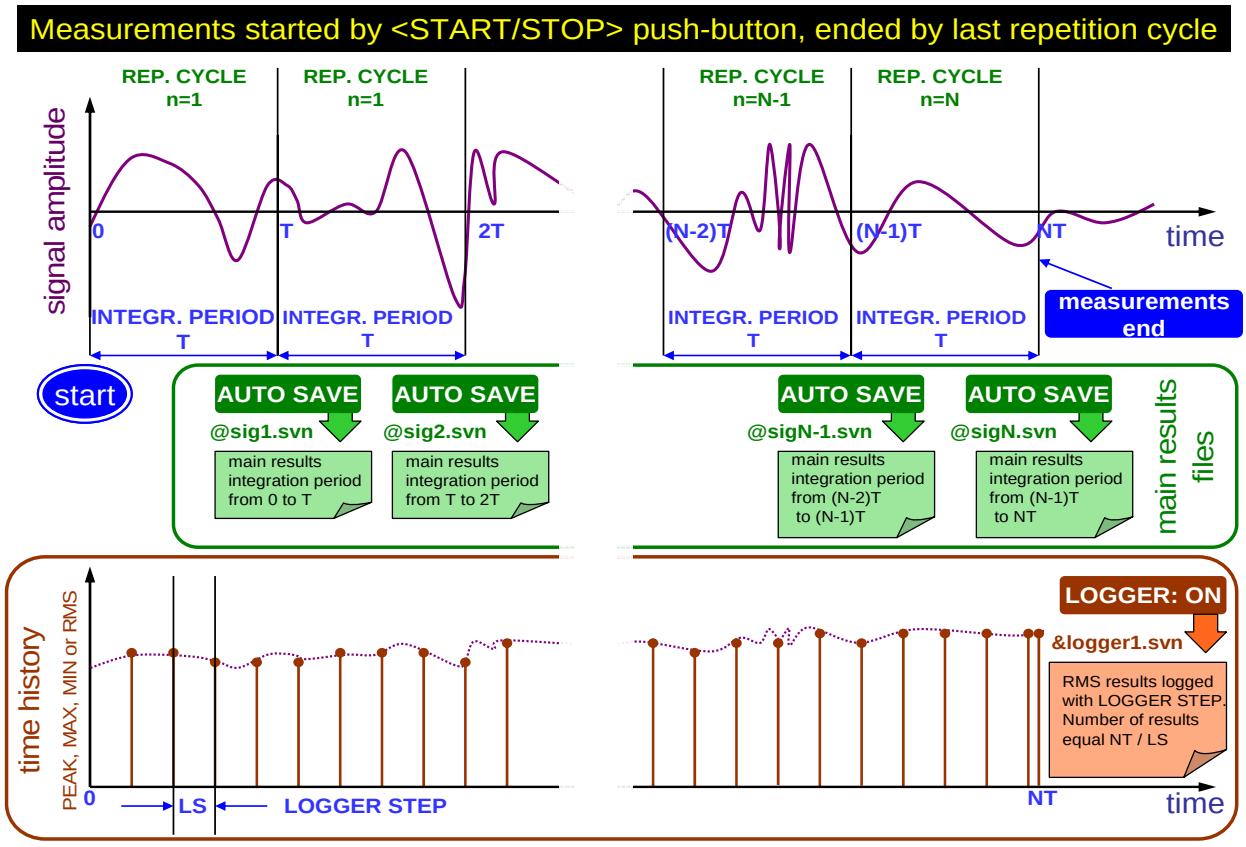
Logger Name edition in Logger Setup window

The edited name is accepted and the file is saved after pressing the **<ENTER>** push-button. The special warning is displayed in the case the file with the edited name already exists in the memory. The instrument waits then for a reaction of the user (any push-button should be pressed except the **<Shift>** or the **<Alt>** one).

Displays during the attempt of overwriting the existing file

The main measurement results (cf. App. B) are calculated in the period set on in the **Meas. Cycle Time**. These results can be saved in the result files in the instrument's or external memory. In the case the **Meas. Cycle Time** is greater than 9 seconds, it can be done also by means of the **Auto Save** operation. In the case the **Repetition Cycles** is greater than one, the **Auto Save** operation will be performed after the period set on in the **Meas. Cycle Time**. The name of the file with the main results is increased by one after each saving.

In the same, when the **Logger Mode** is switched on (**On**), the partial measurement results are calculated in the period set on in the **Logger Step**. Up to 60 results can be logged simultaneously from all channels and profiles of the instrument (**PEAK** / **P–P**/ **MAX** / **RMS** / **VDV**) and two vectors (**VEC13** and **VEC46**) with time step down to 100 ms. These results are saved in one logger file. The name of the file is set on in the **Logger Name** position. The registration in the logger's memory is stopped after the period, which is equal to **Meas. Cycle Time** multiplied by **Repetition Cycles**, after pressing the **<Start/Stop>** push-button or after stopping the measurements remotely.

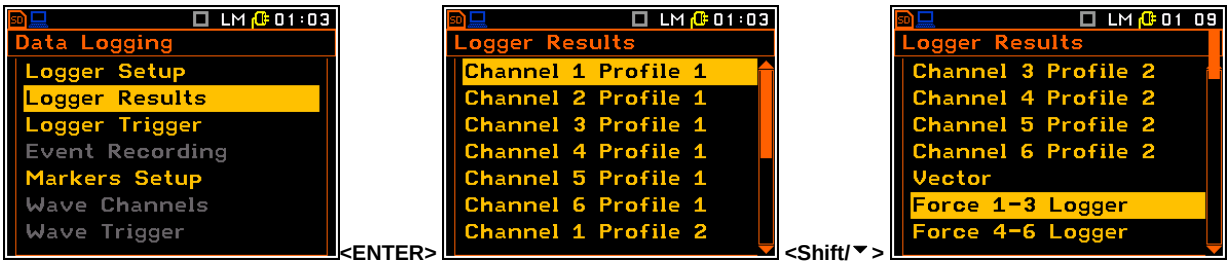


Relations between Integration Period and Logger Step

5.5.2 Results selection – Logger Results

The **Logger Results** list enables the user to activate the results for all channels and profiles (**Channel x Profile x**), for vectors (**Vector**) and for forces (**Force 1-3 Logger** and **Force 4-6 Logger**) for recording their history in the logger file. The view of the **Logger Results** list depends on the settings of the **Enabled Channels** and **Enabled 2nd profiles** parameters (*path: <Menu> / Measurement / Channels Setup*).

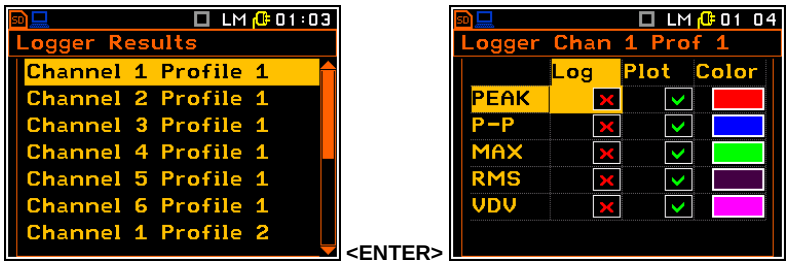
Activation / deactivation can be done by means of the **<◄>**, **<►>** push-buttons pressed together with the **<Shift>** one. The position is changed by means of **<◄>**, **<►>** and **<▲>**, **<▼>** push-buttons.



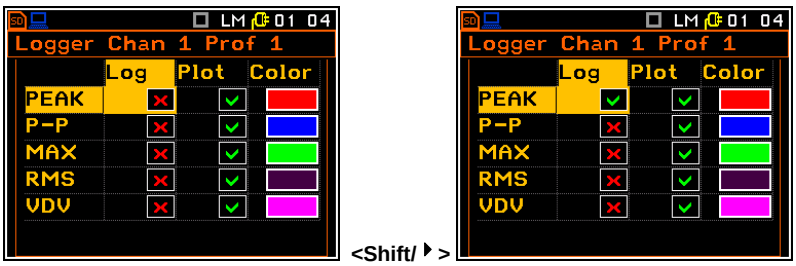
Logger Results list opening

Selection results for channels and profiles – **Channel x Profile x**

The **Channel x Profile x** list enables the user to activate the results for channel **x** and profile **x** (**PEAK**, **P-P**, **MAX**, **RMS** and **VDV**), which will be recorded to the logger file, activate plot and select its color.

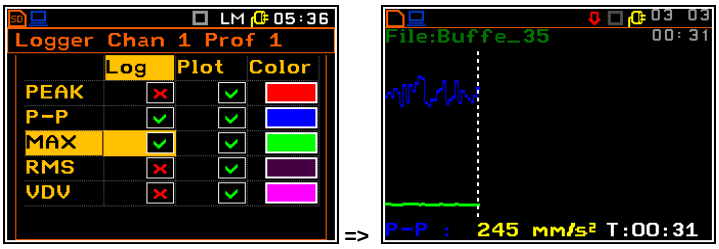


Logger Chan 1 Prof 1 list opening



Logger Results list; PEAK result for the Profile 1 of Channel 1 activation

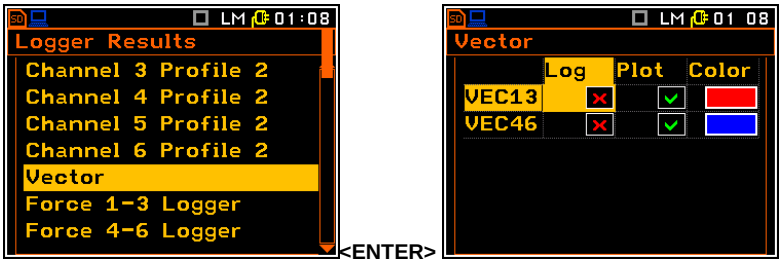
Logger Results list; result changing



Example display of Logger with two selected results

Selection vectors for logging – **Vector**

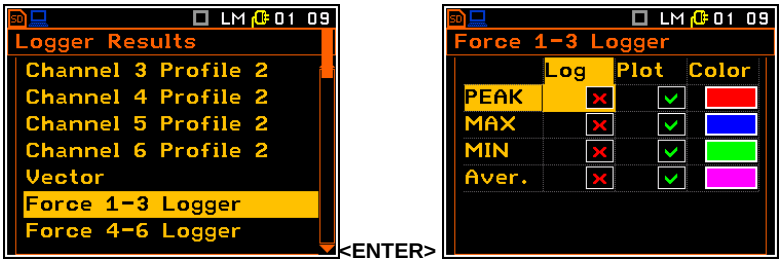
The **Vector** list enables the user to activate the vectors (**VEC13** and **VEC46**), which will be recorded to the logger file, activate plot and select its color.



Vector window opening

Selection …… for logging – **Force 1-3 Logger** & **Force 4-6 Logger**

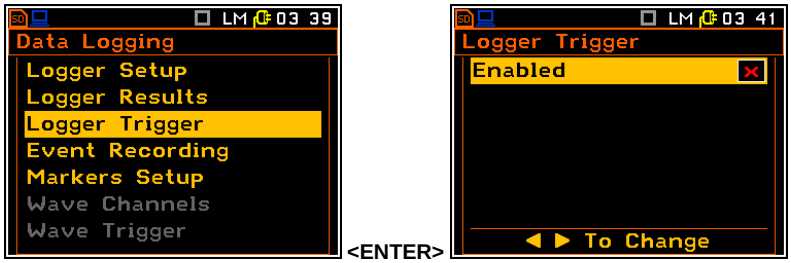
The **Force 1-3 Logger** and **Force 4-6 Logger** lists enable the user to activate (**PEAK**, **MAX**, **MIN** and **Aver.**), which will be recorded to the logger file, activate plot and select its color.



Force 1-3 Logger window opening

5.5.3 Logger trigger parameters setup – Logger Trigger

The **Logger Trigger** parameters influence the way the measurement results are saved in the logger.

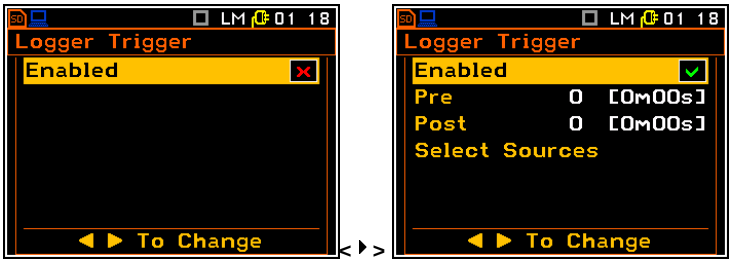


Logger Trigger list opening

In this sub-list the triggering in logger can be switched off or on (**Enabled**), the source of the triggering signal determined (**Select Sources**), the number of the results saved in the logger before the fulfilment of the triggering condition (**Pre**) and the number of the results saved in the logger after the fulfilment of the triggering condition (**Post**) be select. If the triggering condition is fulfilled, the logger contains:

- the measurement results registered directly before the fulfilment of the triggering condition; time of the registration can be calculated by multiplying the value set in the **Pre** by the time period taken from the **Logger Step** (*path: Menu / Measurement / Data Logging / Logger Setup*);
- all measurement results up to the moment the triggering signal falls down the **Level**;
- the results registered directly after the fulfilment of the triggering condition; time of the registration can be calculated by multiplying the value set in the **Post** by the time period taken from the **Logger Step** (*path: Menu / Measurement / Data Logging / Logger Setup*).

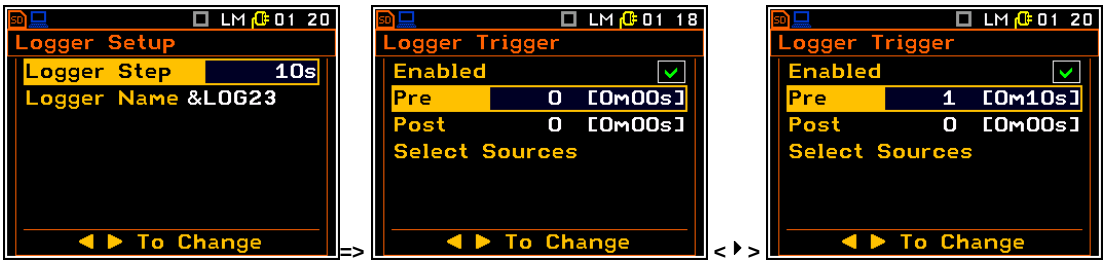
The logger triggering of the measurements (**Enabled**) can be switched on with the **< ▸ >** push-button.



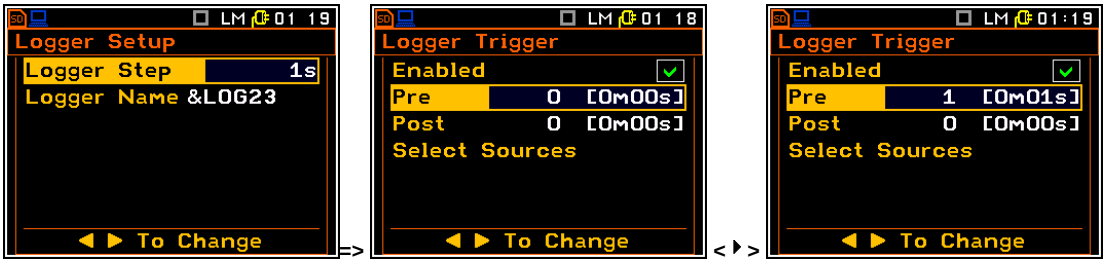
Logger Trigger enabling

In the **Pre** line the number of the results registered in the logger's file before the fulfilment of the triggering condition can be set. This number is within the limits 0..20.

The period of the measurements, which are saved in the logger before the fulfilment of the triggering condition, can be calculated multiplying the value set in the **Pre** by the value set in the **Logger Step** (*path: Menu / Measurement /Data Logging / Logger Setup*). The result of the calculation is presented in the same line, at the right side of the display.



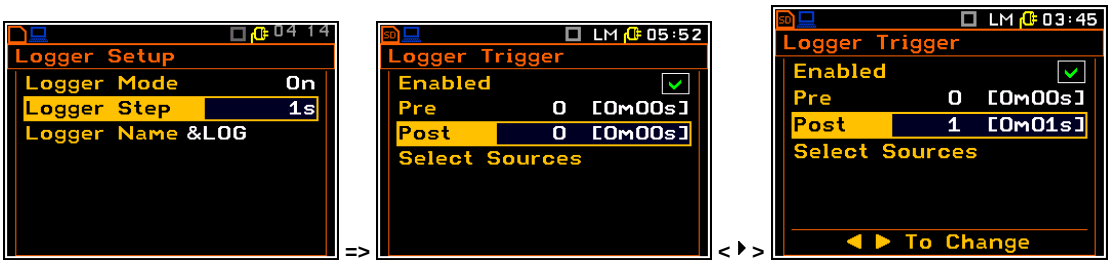
Logger Trigger windows with the Pre selection with Logger Step equal to 10 s



Logger Trigger windows with the Pre selection with Logger Step equal to 1 s

In the **Post** line the number of the results registered in the logger's file after the fulfilment of the triggering condition can be set. This number is within the limits 0..200.

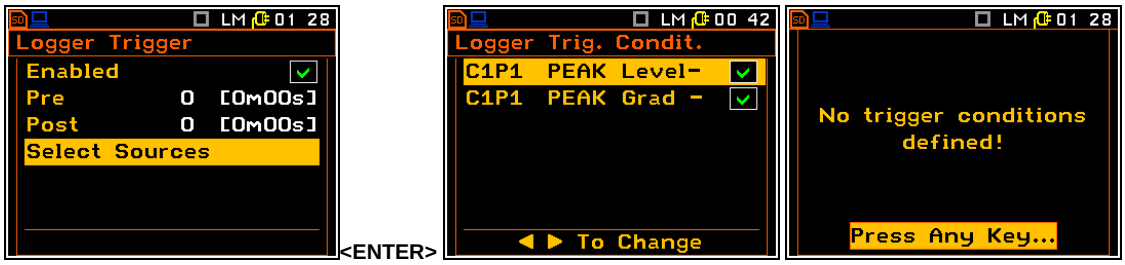
The period of the measurements, which are saved in the logger after the fulfilment of the triggering condition, can be calculated multiplying the value set in the **Post** by the value set in the **Logger Step** (*path: Menu / Measurement / Logging / Logger / Logger Setup*). The result of the calculation is presented in the same line, at the right side of the display.



Logger Trigger windows with the Post selection with Logger Step equal to 1 s

The position **Select Sources** determines the source of the triggering signal. The sources for triggering are defined in the **Trigger Conditions** position of **Measurement** list and can be selected in the **Select Sources** window. If more than one source is selected, then the trigger will be switched on when one of these conditions are fulfilled. The logger will be filled on until all conditions are ceased.

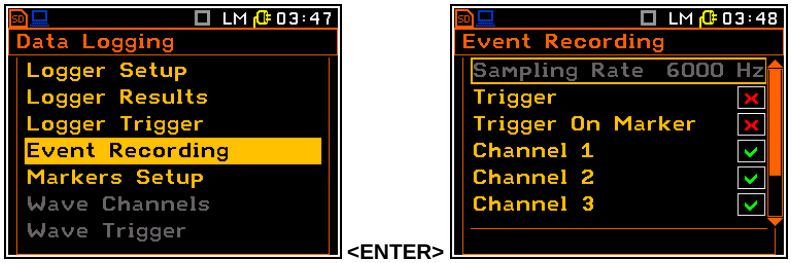
To open this position one should select it and press **<ENTER>** push-button.



Select Sources list opening; Logger Events windows with defined events and events not defined

5.5.4 Event recording setup – Event Recording

The **Event Recording** enables the user to activate and to set the parameters of event signal recording on the external memory (**SD Card**).

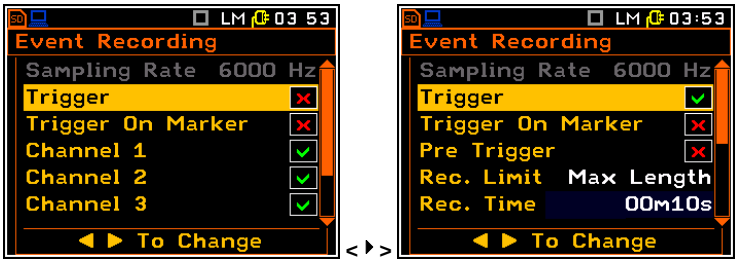


Event Recording list opening

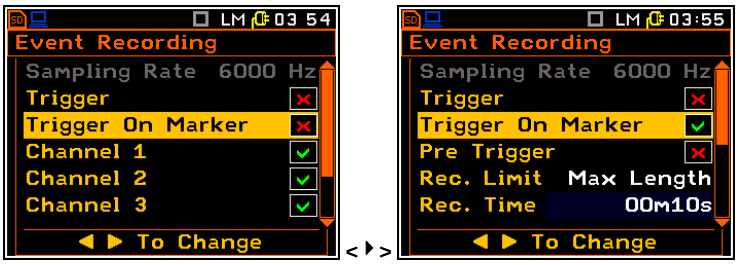
The **Sampling Rate** position displays the sampling frequency of event recording.

When **Trigger** position is selected then event recording will start by the measurement trigger. When **Trigger On Marker** position is selected then event recording will start by the marker initiated by the user. When **Trigger** and **Trigger On Marker** event recording were chosen then event recording will start when one of these triggering conditions are fulfilled.

When **Trigger** or **Trigger On Marker** event recording is chosen then additional positions appears. These positions enable one to programme additional parameters for the event recording.

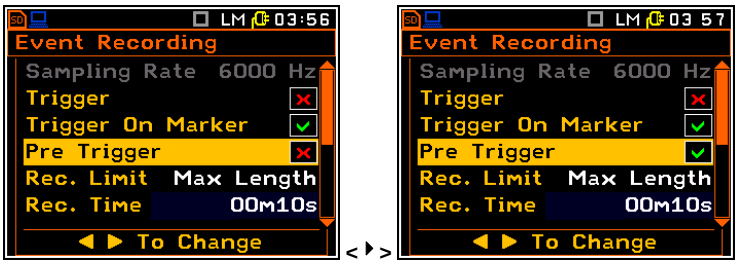


Trigger parameter selection



Trigger On Marker parameter selection

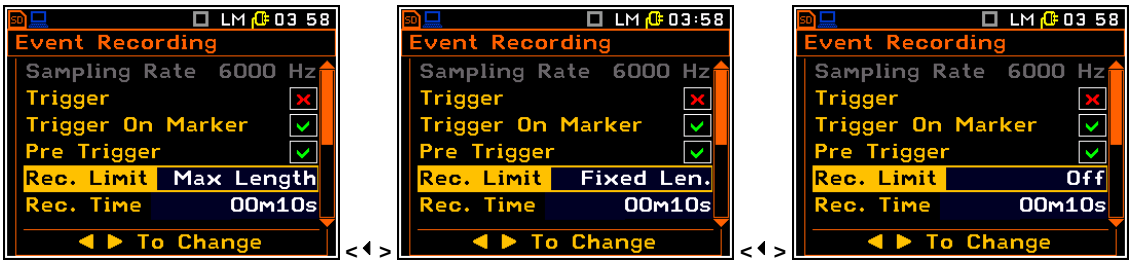
When **Pre Trigger** position is switched on then the signal is recorded before the triggering condition with interval, defined by the position **Pre** of the **Logger Trigger** window (*path: <Menu> / Measurement / Data Logging*).



Pre Trigger parameter selection

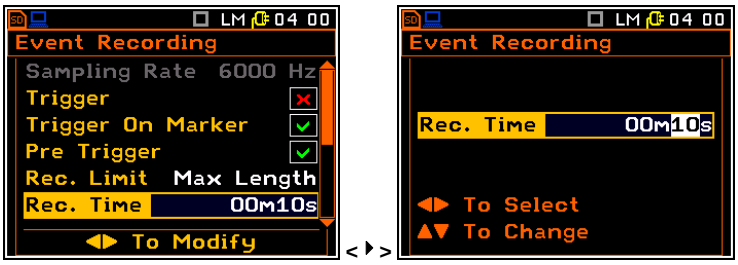
In the **Rec. Limit** position it is possible to select the time of signal recording after triggering. If the triggering condition appears then the signal will be recording during the period defined in **Rec. Time**. The available values are: **Max Length**, **Fixed Len.** or **Off**.

When **Off** is chosen then the event signal will be recording as long as memory is filling or until the trigger condition ceased. When **Max Length** is chosen then the signal will be recording during period defined in the **Rec. Time**, but can be stopped earlier if trigger condition ceased. When **Fixed Len.** is chosen then the signal will be recording during period defined in the **Rec. Time**, even when trigger condition ceased.



Rec. Limit parameter selection

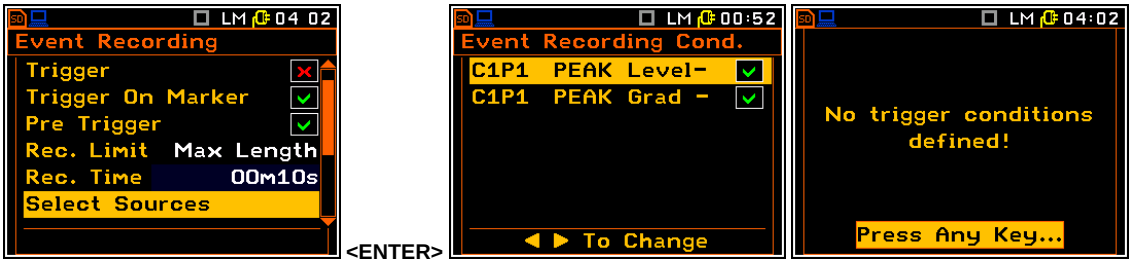
In the **Rec. Time** position it is possible to select the time of signal recording after triggering. If next triggering condition appears then the signal will be recording additional **Rec. Time**.



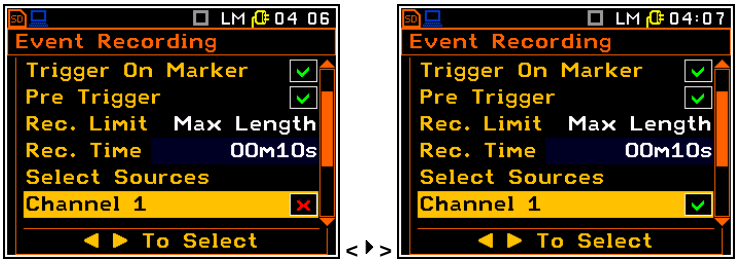
Rec. Time parameter selection

The position **Select Sources** determines the source of the triggering signal. The sources for triggering are defined in the **Trigger Conditions** position of **Measurement** list and can be selected in the **Select Sources** window. If more than one source is selected, then the trigger will be switched on when one of these conditions are fulfilled. The logger will be filled on until all conditions are ceased.

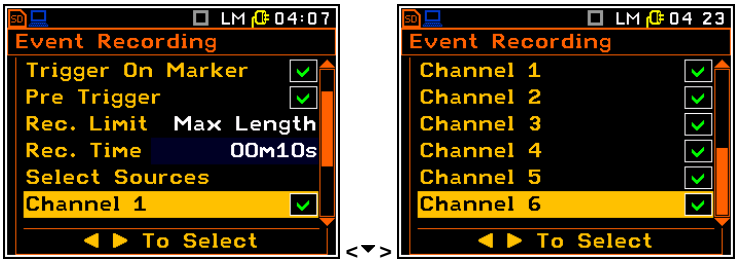
To open this position one should select it and press **<ENTER>** push-button.



Select Sources position opening; Event Recording Cond. window opening



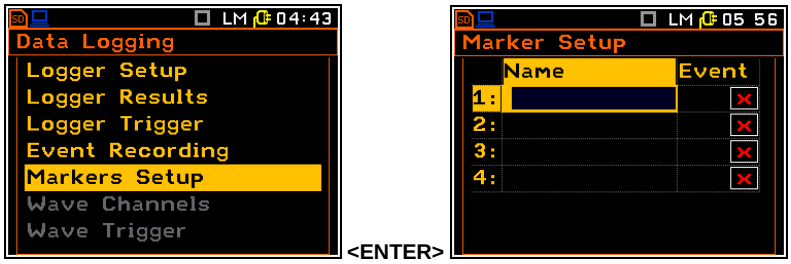
Selection Channel 1 for record



Selection all channels for record

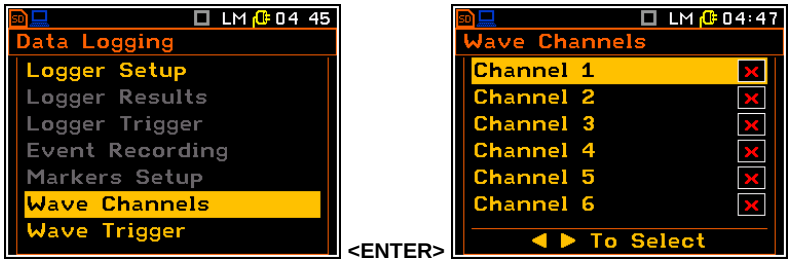
5.5.5 The marker setup – Marker Setup

The **Marker Setup** enables the user to assign the name for each marker.



Event Recording list opening

5.5.6 Setting-up the Wave recorder function – Wave Channels

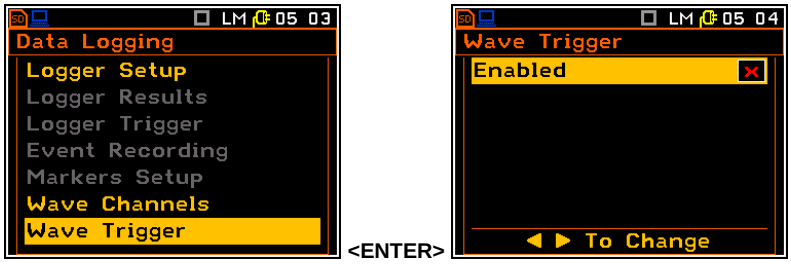


Wave Setup list opening

The **Channel x** positions enable the user to select the channels which signal will be recorded.

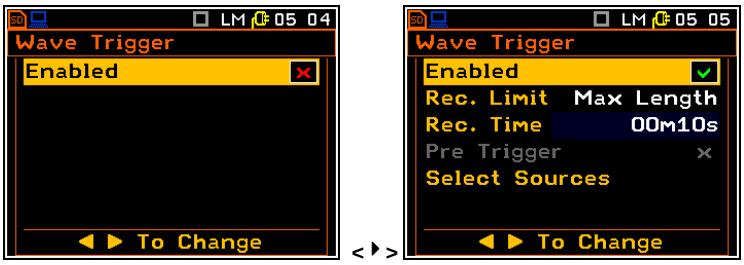
5.5.7 Wave recorder trigger setup – Wave Trigger

The **Wave Trigger** enables the user to activate and programme the wave recorder trigger.



Wave Recorder Trigger list opening

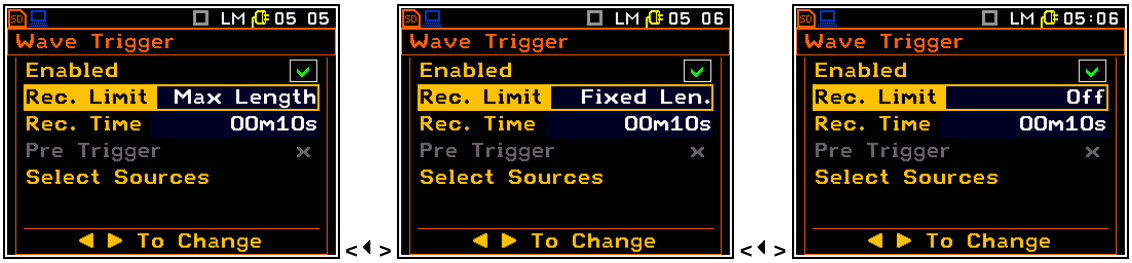
The position **Enabled** switches on/off the **Wave Trigger**.



Wave Trigger switching on

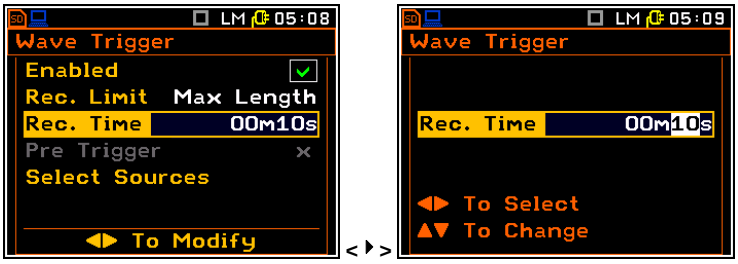
In the **Rec. Limit** position it is possible to select the time of signal recording after triggering. If the triggering condition appears then the signal will be recording during the period defined in **Rec. Time**. The available values are: **Max Length**, **Fixed Len.** or **Off**.

When **Off** is chosen then the signal will be recording as long as memory is filling on until the trigger condition ceased. When **Max Length** is chosen then the signal will be recording during period defined in the **Rec. Time**, but can be stopped earlier if trigger condition ceased. When **Fixed Len.** is chosen then the signal will be recording during period defined in the **Rec. Time**, even when trigger condition ceased.



Rec. Limit parameter selection

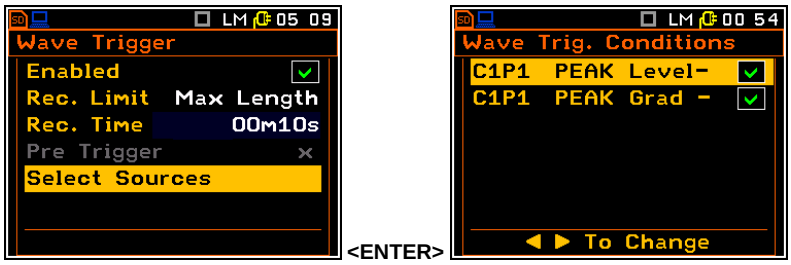
In the **Rec. Time** position it is possible to select the time of event signal recording after triggering. If next triggering condition appears then the signal will be recording additional **Rec. Time**.



Rec. Time parameter selection

The position **Select Sources** determines the source of the triggering signal. The sources for triggering are defined in the **Events & Alarms** position of **Measurement** list and can be selected in the **Select Sources** window. If more than one source is selected then the trigger will be switched on when one of these conditions are fulfilled. The logger will be filled on until all conditions were not fulfilled.

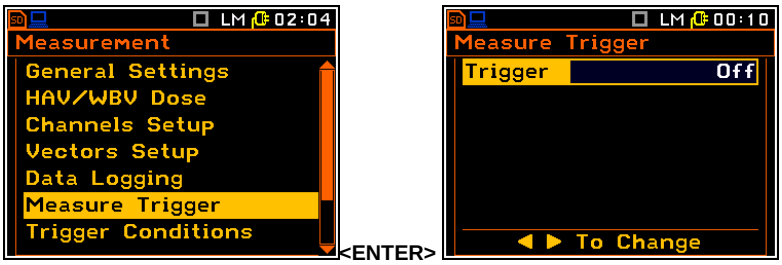
To open this position one should select it and press **<ENTER>** push-button.



Wave Trig. Conditions window opening

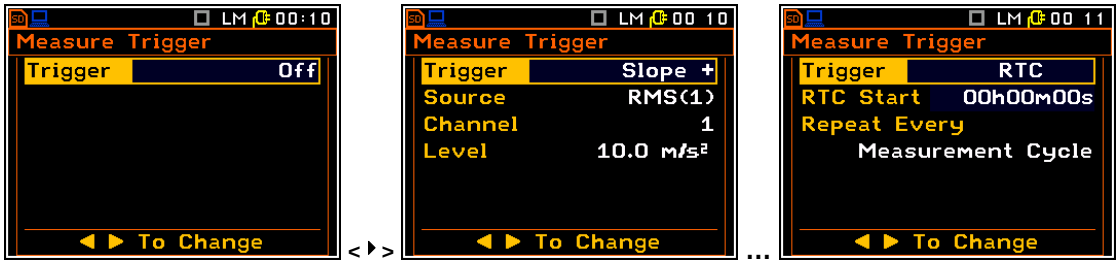
5.6 Measure triggering parameters selection – Measure Trigger

The **Measure Trigger** sub-list enables the user to set the triggering parameters.



Measurement list; Measure Trigger window opening

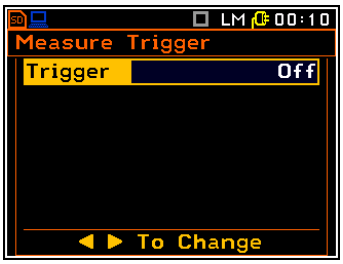
The **Measure Trigger** is a contexts sub-list in which the triggering can be switched off or on (**Trigger**), in the case when on - the source of the triggering signal can be determined (**Source**), its level (**Level**) and sometimes also the speed of changes (**Gradient**).



Measure Trigger windows

Switching the triggering on and off – **Trigger**

The triggering of the measurements (**Trigger**) can be switched off using the **< ◀ >** push-buttons.

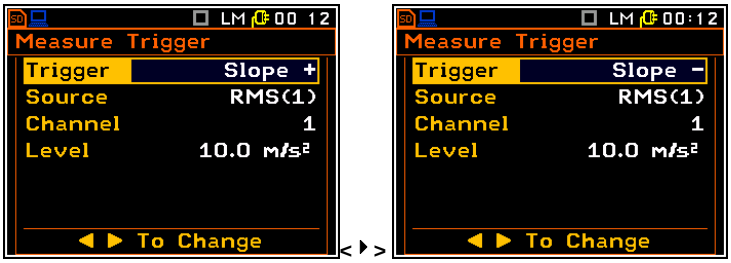


Measure Trigger window; Trigger switched off

triggering is switched on if one of its six modes is selected: **Slope +**, **Slope –**, **Level +**, **Level –** or **Grad +**. If the instrument works with the triggering switched on, the appropriate icon appears on the display in the case when the triggering condition was not fulfilled. The triggering condition is checked every 0,5 seconds.

Switching the triggering by means of measured signal - **Slope/Level/Grad**

In the case when the **Slope +** is selected, the measurement starts when the arising signal will pass the level determined in the **Level**. In the case when the **Slope –** is selected, the measurement starts when the falling down signal will pass the level determined in the **Level**. The measurement is stopped when the conditions set in the **General Settings** sub-list are fulfilled, after pressing the **<Start/Stop>** push-button or after receiving the proper control code remotely. The next sources of the triggering signal are available: **RMS(1)**, **VEC46**, **VEC13** or **External**.

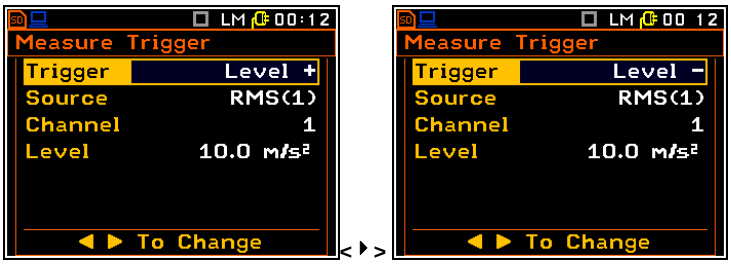


Measure Trigger windows with the Slope modes selected

In the case when the **Level +** is selected, in each 0,5 second of the measurement the triggering condition is checked; the measurement is registered only when the signal has the greater level than this determined in the **Level** and in the other case the measurement result is skipped.

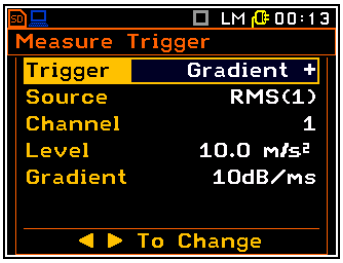
In the case when the **Level –** is selected, in each second of the measurement the triggering condition is checked; the measurement is registered only when the signal has the lower level than this determined in the **Level** and in the other case the measurement result is skipped.

The next sources of the triggering signal are available: **RMS(1)**, **VEC46** or **VEC13**.



Measure Trigger windows with the Level modes selected

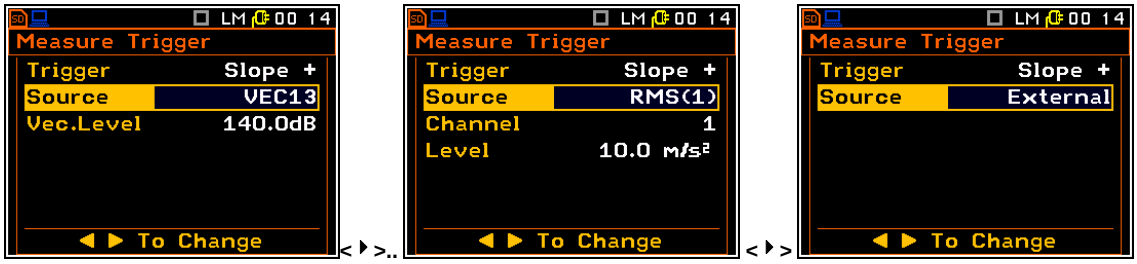
In the case when the **Grad +** is selected, in each 0,5 second of the measurement the triggering condition is checked; the measurement is registered only when the signal has the greater level than this determined in the **Level** and the gradient of the signal is greater than this determined in the **Gradient** position. In the other case the measurement result is skipped. The only one sources of the triggering signal is available: **RMS(1)**.



Measure Trigger window with the Gradient + mode selected

Selection of the triggering signal - **Source**

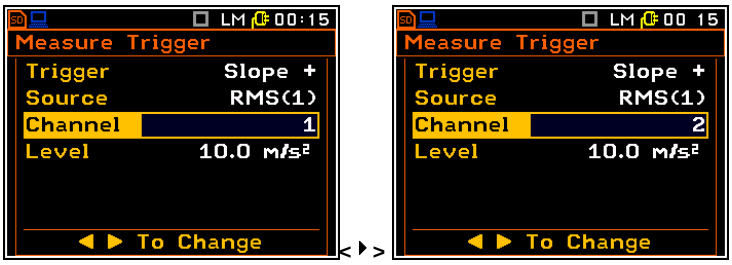
The user can select several sources of the triggering signal: the output signal from the RMS detector coming from the first profile which is denoted here as **RMS(1)**, **VEC46**, **VEC13** or **External**.



Measure Trigger windows; Source signal selection

Setting the channel of the triggering signal - **Channel**

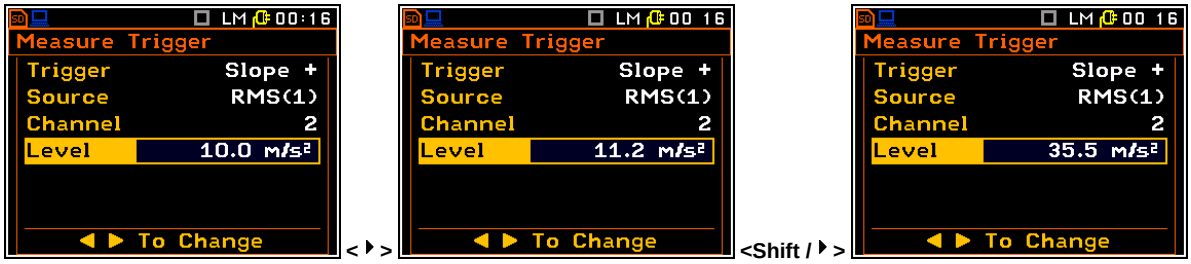
The **Channel** parameter denotes the channel of the triggering signal.



Measure Trigger windows; Channel selection

Setting the level of the triggering signal – **Level**

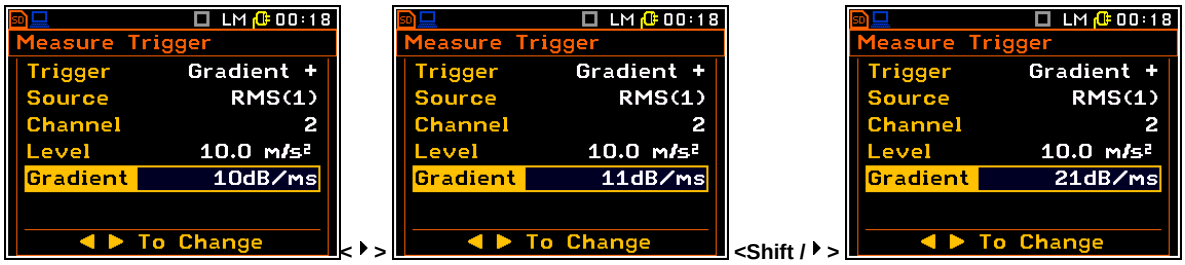
The level of the triggering signal (**Level**) can be set in 1 dB step (or 10 dB steps) from 24 dB to 136 dB range.



Measure Trigger windows; Level selection

Setting the speed of the triggering signal changes – **Gradient**

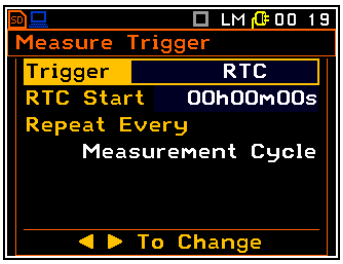
This position appears when the **Grad+** trigger is chosen. The speed of the triggering signal changes (**Gradient**) can be set from 1 dB/ms to 100 dB/ms range.



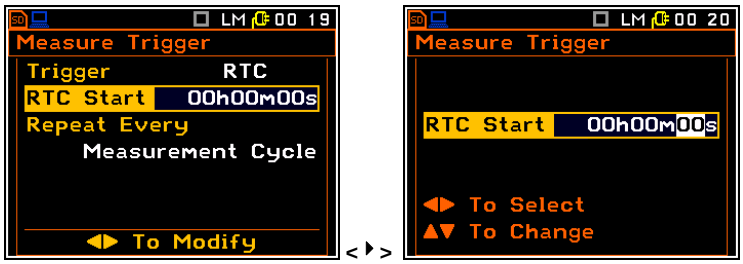
Measure Trigger windows ; Gradient selection

Switching the triggering by means of **RTC**

In the case when the **RTC** (Real Time Clock) is selected the triggering is done at the time set up by **RTC Start**. The user has to press **<Start>** push-button and the measurement will be triggered on time selected in **RTC Start**.

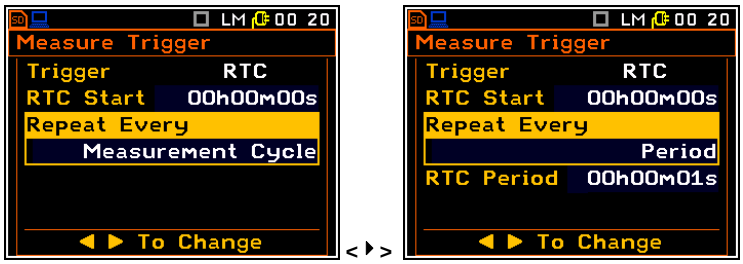


Measure Trigger window with the RTC mode selected

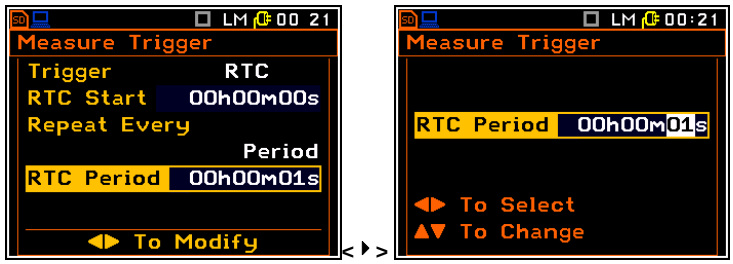


Measure Trigger window with the RTC Start time selection

The measurement is repeated with the step selected in **Repeat Every** position. The parameter **Repeat Every** can have values: **Measurement Cycle** or **Period**. If **Period** is selected then additional position **RTC Period** appears.



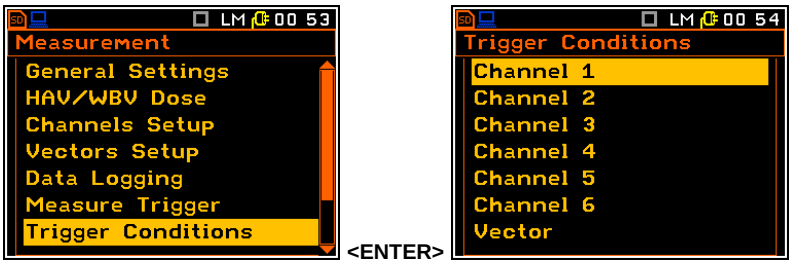
Measure Trigger window; Repeat Every selection



Measure Trigger window; RTC Period selection

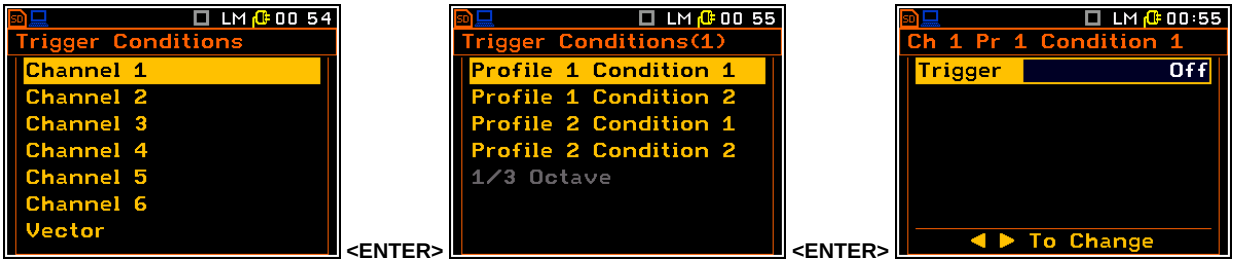
5.7 Definition the list of events for triggering – Trigger Conditions

The **Trigger Conditions** position enables the user to create the list of conditions for triggering. Trigger conditions can be defined based on results, calculated in each profile of each channel, and can be defined also based on vector results.



Events & Alarms window; the Trigger Events Setup sub-list selection

The **Trigger Conditions** list contains positions, which enable one to setup the conditions based on channel's signals (**Channel x**) and for vectors (**Vector**). **Channel x** position opens lists with **Profile x Condition x** positions.

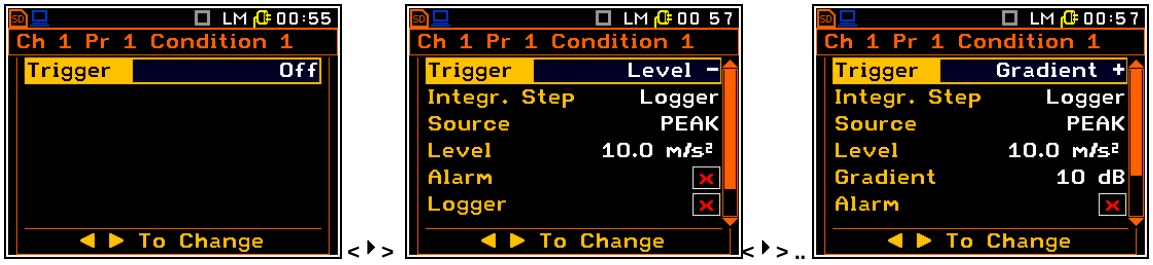


Trigger Condition selection for channel

The **Ch x Pr x Condition x** list enables one to program one of two possible triggering condition (**Condition x**) for **Profile x** of the **Channel x**. It is a contexts sub-list in which the triggering can be switched off when the **Off** value of the **Trigger** parameter is chosen or switched on in other cases.

Selection the trigger mode – **Trigger**

The **Trigger** position enables one to switch the trigger on and select it's type: **Level -**, **Level +**, **Slope -** , **Slope +**, **Gradient -** and **Gradient +**.



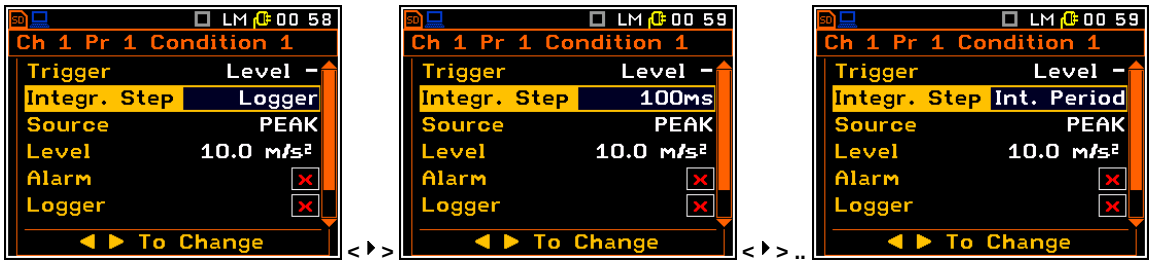
Trigger type selection

In each **Integr. Step** of the measurement the triggering condition is checked and:

- in the case of **Level +** is selected, the triggering condition is fulfilled only when the **Source** has the greater value than this determined in the **Level** position and in the other cases the triggering condition is not fulfilled.
- in the case of **Level –** is selected, the triggering condition is fulfilled only when the **Source** has the lower value than this determined in the **Level** position and in the other cases the triggering condition is not fulfilled.
- in the case of **Slope +** is selected, the triggering condition is fulfilled only when the arising value of the **Source** is passing the level determined by the **Level** parameter.
- in the case of **Slope –** is selected, the triggering condition is fulfilled only when the falling down value of the **Source** is passing the level determined by the **Level** parameter.
- in the case of **Gradient +** is selected, the triggering condition is fulfilled only when the signal has the greater level than this determined in the **Level** and the gradient of the signal is greater than this determined in the **Gradient** position. In the other cases the triggering condition is not fulfilled.
- in the case of **Gradient -** is selected, the triggering condition is fulfilled only when the signal has the lower level than this determined in the **Level** and the gradient of the signal is lower than this determined in the **Gradient** position. In the other cases the triggering condition is not fulfilled.

Selecting the step of checking the triggering condition – **Integr. Step**

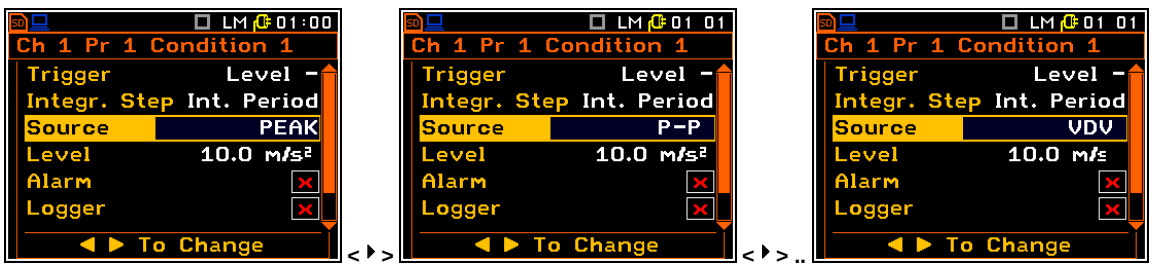
The **Integr. Step** position enables one to select integration time for condition evaluation: **Logger**, **100ms**, **1.0s**, **Meas. Time** and **Int. Period**.



Integr. Step selection

Selection the source for triggering condition – **Source**

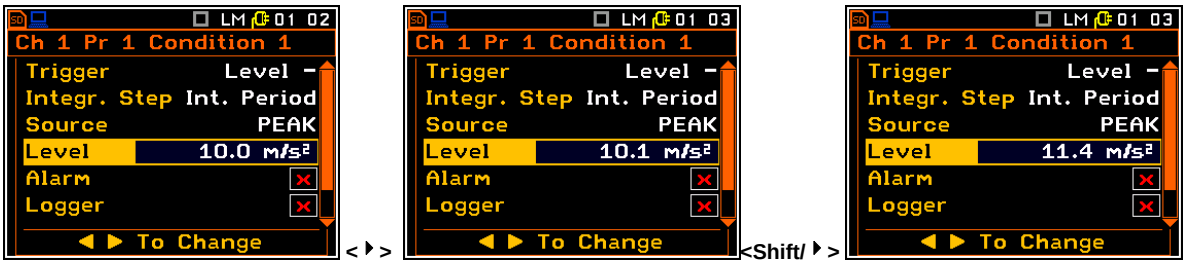
The **Source** position enables one to select the source for triggering condition: **PEAK**, **P-P**, **MAX**, **MIN**, **RMS** or **VDV**.



Source selection

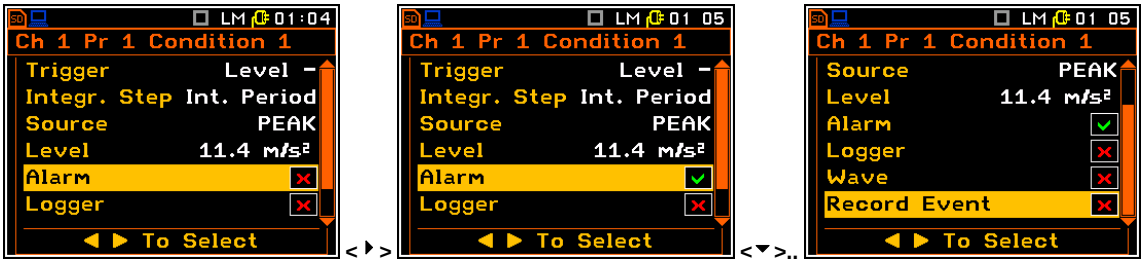
Selection the value of threshold for triggering condition – **Level**

The **Level** position enables one to select the value of threshold for triggering condition. The level of the triggering source can be set in a range from **60 dB** to **200 dB** or from **1.00 mm/s^2** to **10.0 km/ s^2**.when linear units were selected in **Results Scal**e position of **Display** menu.

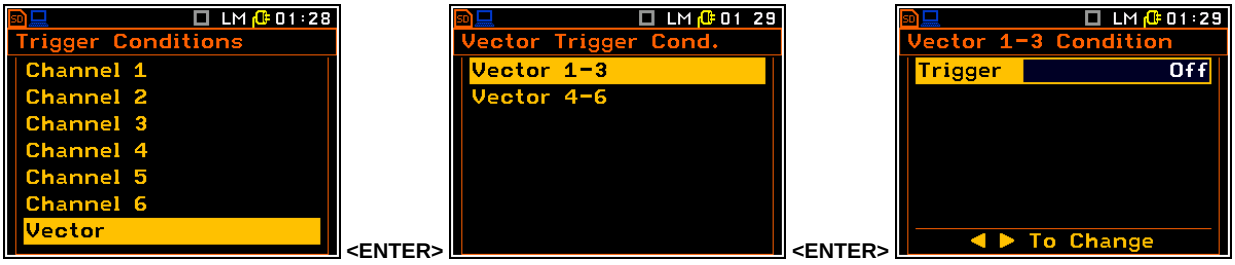


Level selection

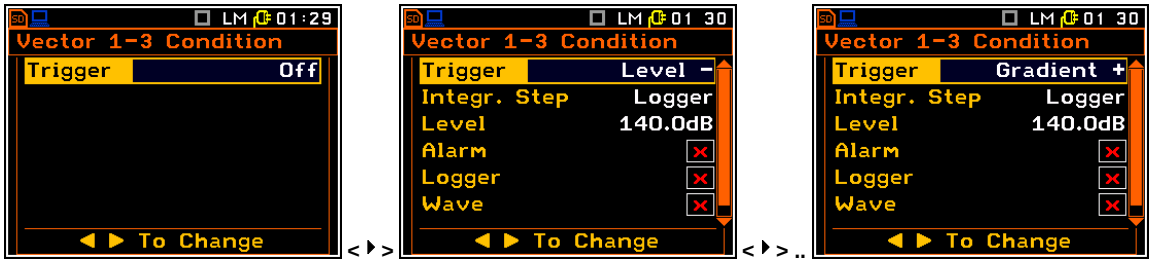
The four last positions enable one to assign the action for the current trigger event for triggering alarm signal (**Alarm**), logger (**Logger**), wave recording (**Wave**) and event recording (**Record Event**).



Trigger Actions assignment



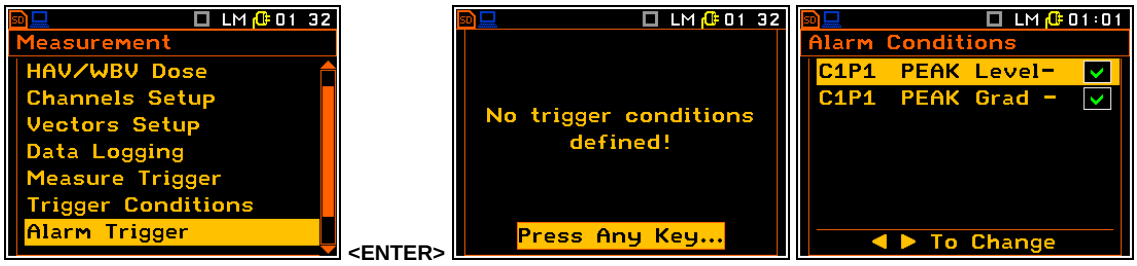
Trigger Condition selection for vector



Trigger type selection

5.8 Selection of the events to switch on the alarm trigger - Alarm Trigger

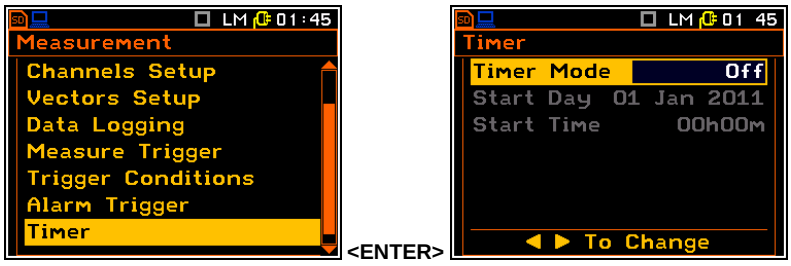
The **Alarm Trigger** sub-list enables one to select among the events these ones that will be used for triggering alarm.



Alarm Trigger list opening

5.9 Programming the instrument's internal timer – Timer

The **Timer** enables one to programme the internal timer. The instrument can be switched on automatically in the programmed time and perform the measurement with settings used before the instrument was switched off.

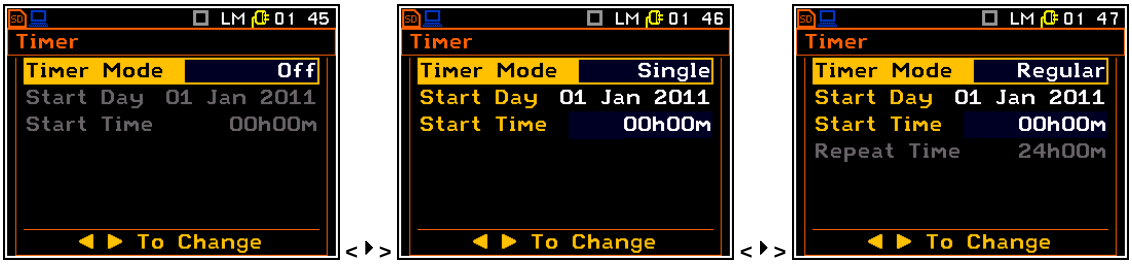


Measurement list, the Timer window opening

Selecting the mode of the timer function – **Mode**

The timer can be switched off – **Off**, switched on only once – **Single**, or switched on many times regularly – **Regular** with the period between two consecutive measurements set in the **Repeat Time** line as 24 hours. It means that the unit will be switched on once a day at the same time until one disables timer function.

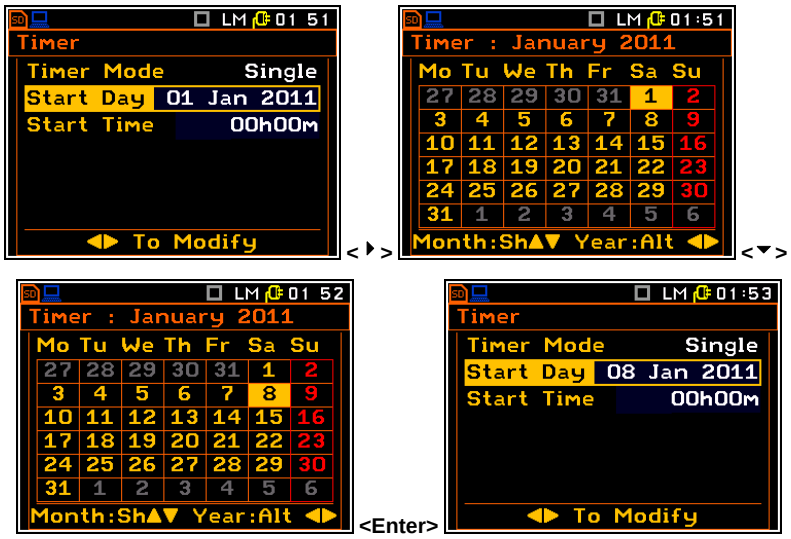
If the instrument was switched on by means of Timer then the "**clock**" icon appears on the screen.



Timer windows; the mode selection

Setting day of the instrument's switch on - **Start Day**

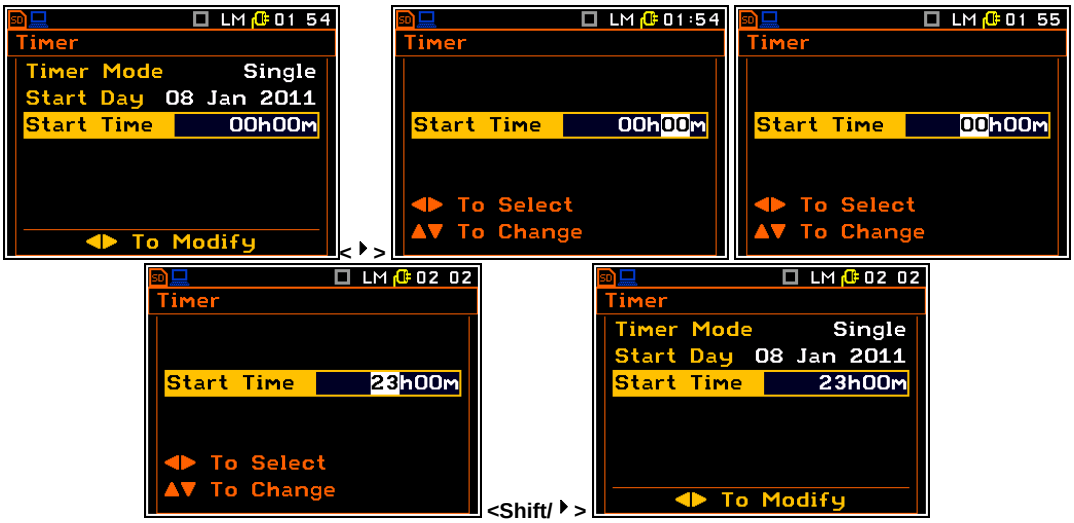
The **Start Day** determines the date of the measurement start. The timer can be programmed up to one month ahead and during the date setting the current state of the **R**eal **C**lock is taken into account. The required date can be selected in the special window, which is opened by means of the **<◀ >**, **<▶ >** push-buttons.



Timer windows; setting day of the instrument's switch on

Setting hour of the instrument's switch on – **Start Hour**

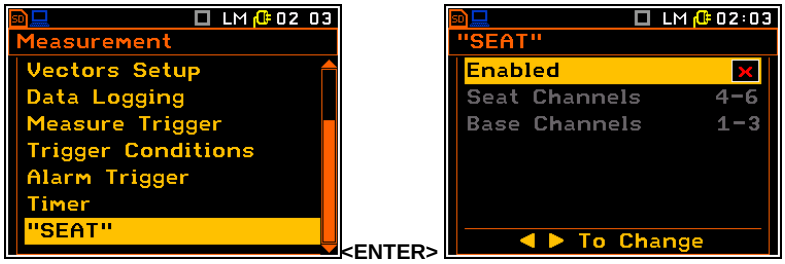
The **Start Time** determines hour of the measurement start. The required hour can be selected in the special window, which is opened by means of the **<◀ >**, **<▶ >** push-buttons.



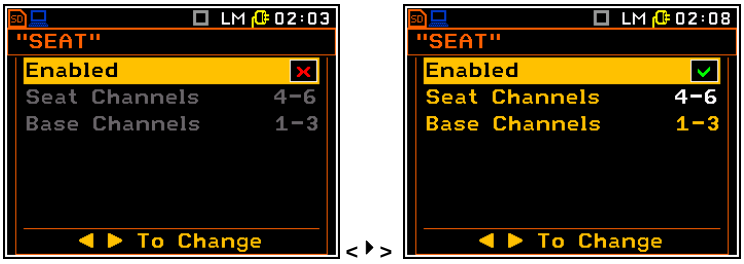
Timer windows; setting hour and minute of the instrument's switch on

5.10 Settings whole body measurements with the use of seat accelerometer – “SEAT”

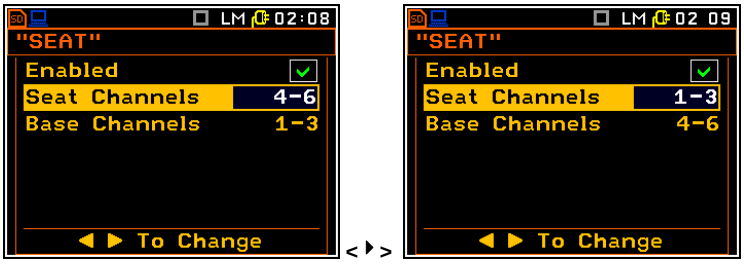
The **“SEAT”** window enables the user to switch on “SEAT” measurements and to assign channels for tree axial seat accelerometer (**Seat channels**) or (**Base channels**).



Auxiliary Functions; “SEAT” window opening



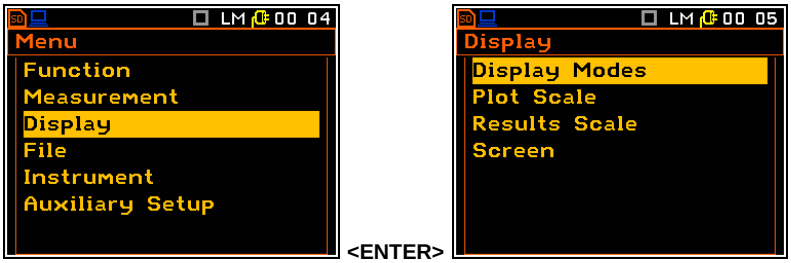
SEAT measurements switching on



Channels assignment

6 DATA AVAILABLE ON THE DISPLAY – Display

The **Display** list contains the elements that enable one the independent programming of the display parameters. In order to open the **Display** list the user has to press the **<Menu>** push-button, select the **Function** text and press **<ENTER>**.



Display window

The **Display** list is used for setting the various parameters, which are mainly dedicated for the control of the display. The list consists of:

Display Modes enables one to select the mode of the measurement results presentation;

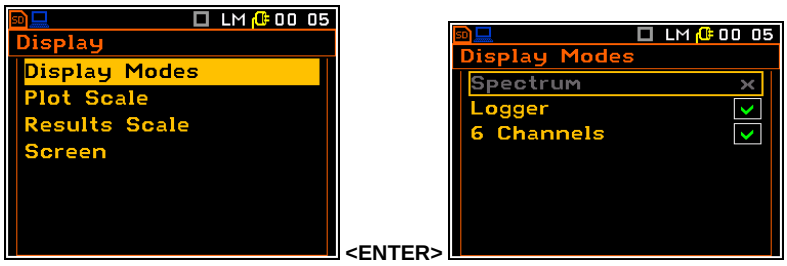
Plot Scale enables one to change the plot scale of results presentation;

Results Scale enables one to change the scale of result's presentation;

Screen enables one to set the brightness and the switch on/off the screen saver of the instrument's display.

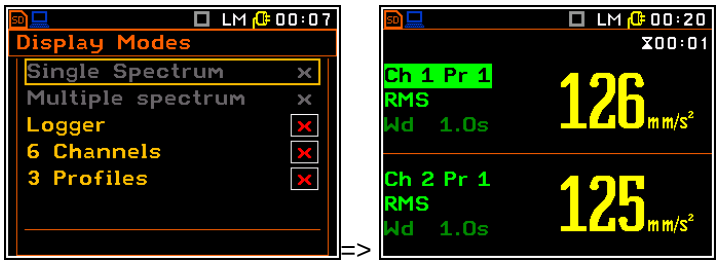
6.1 Selection of the modes of measurement results presentation - Display Modes

The **Display Modes** list enables one to switch on or off the currently available modes of displaying the results of measurement. The mode of the results presentation is related with the selection of the instrument's function (**LM**, **1/1 Octave**, **1/3 Octave**, etc.).

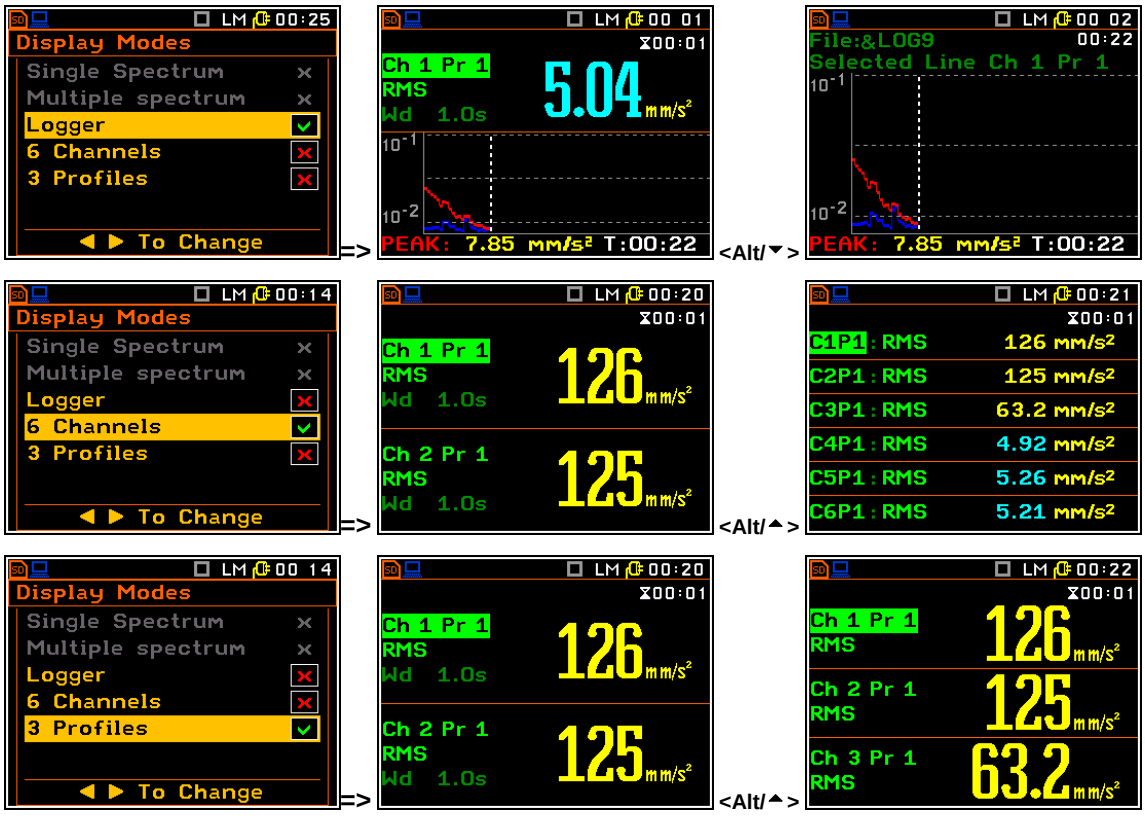


Display Modes windows in the Sound Level Meter mode

When all display modes in the **Display Modes** list are switch off the only main presentation mode with two results is available. Any attempt to switch the mode by means of **<Alt>** and **<▲>**, **<▼>** push-buttons give no results.



Two results main presentation mode



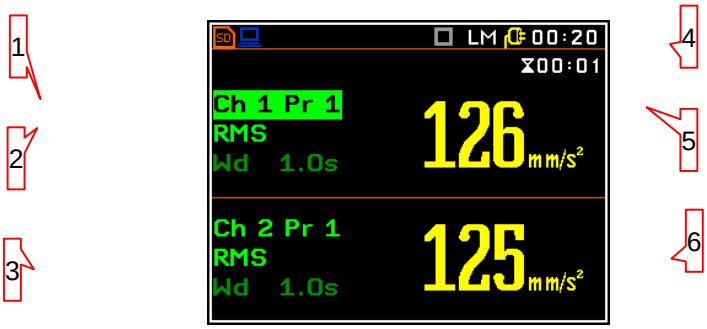
Display Modes window and available results presentation modes

When all display modes in the **Display Modes** list are switch on both all presentation modes are available and can be switch the mode by means of **<Alt>** and **<▲>**, **<▼>** push-buttons give no results.

6.1.1 Main presentation mode

The main presentation mode is always active and it is not possible to switch it off. The display with the measurement results in main presentation mode is presented below

Fields description of the **two results** view

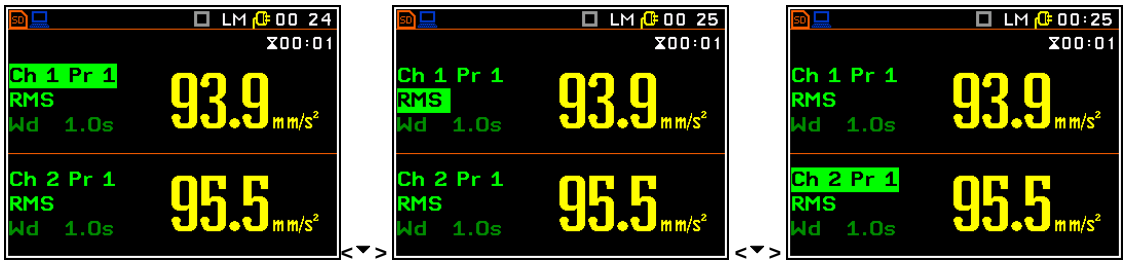


Display in two results presentation mode

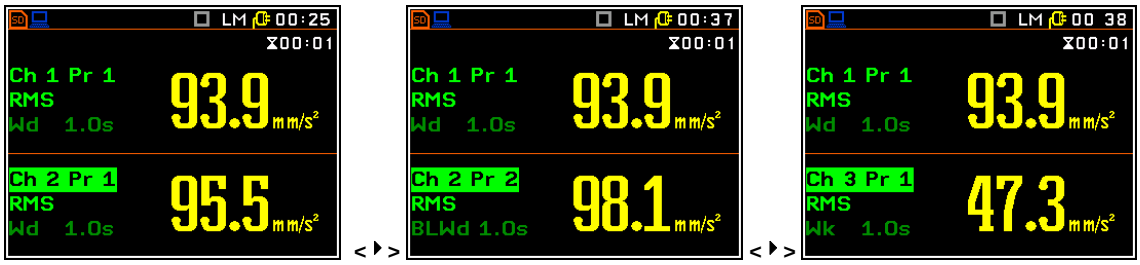
1. Channel and Profile number.
2. Function name: **RMS**, **VDV, CRF**, **OVL**, **PEAK**, **P–P**, **MTVV**.
3. The name of the implemented filter: **HP** , **Wh**, **Wk**, **Wd**, **Wc**, **Wj**, **Wm**, **Wg**, **Wb**, **Wf**, **BL Wh**, **BL Wk**, **BL Wd**, **BL Wc**, **BL Wj**, **BL Wm**, **BL Wg**, **BL Wb**, and **BL Wf** and detector time constant: **1.0 s**.
4. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Meas. Cycle Time**].
5. The value of measured function.
6. Units of measured value.

The change between positions is made by pressing the **<▲>** or **<▼>** push-buttons. When Profile or Function position is chosen, then the profile number or function name is changed after pressing the **<◀>** and **<▶>** push-buttons.

The presentation mode is changed after pressing the **<▲>** or **<▼>** push-buttons pressed together with the **<Alt>** one.

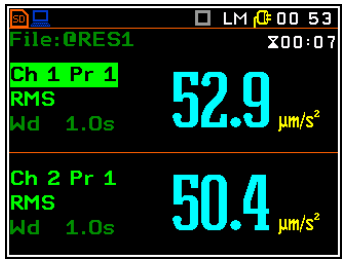


Change of positions



Change of profiles

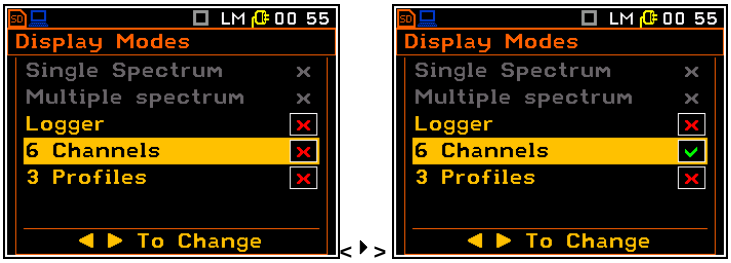
When **Auto Save** function is active the file name is indicated on the upper screen field.



Two profiles presentation mode with autosave file name @RES1

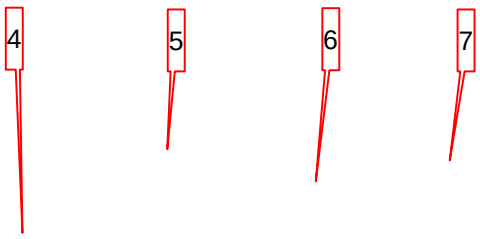
6.1.2 Presentation mode for six channels - 6 Channels

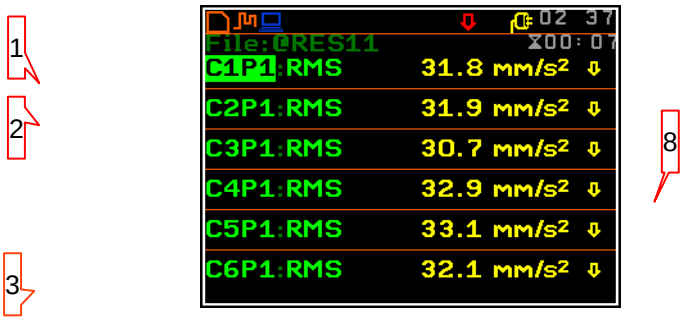
The six channels measurement result's presentation mode (**6 Channels**) shows simultaneously results for six channels. If not **All** channels are enabled in **Channel Activation** window (path: <Menu> / Measurement / Channels Setup) the **6 Channels** mode is not active.



Setting on the accessibility of 6 Channels presentation mode

Fields description of the **6 channels** view

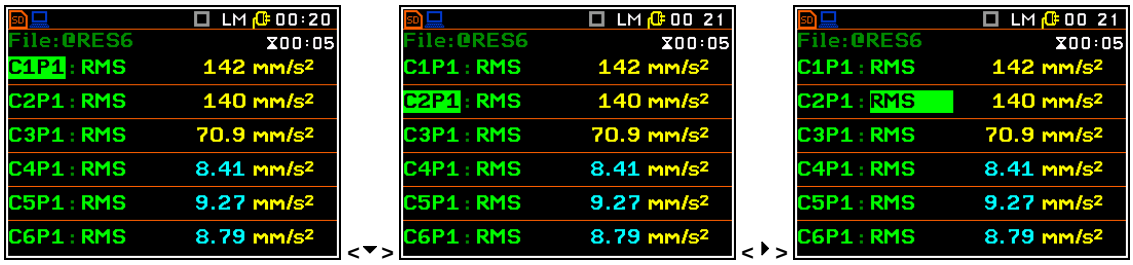




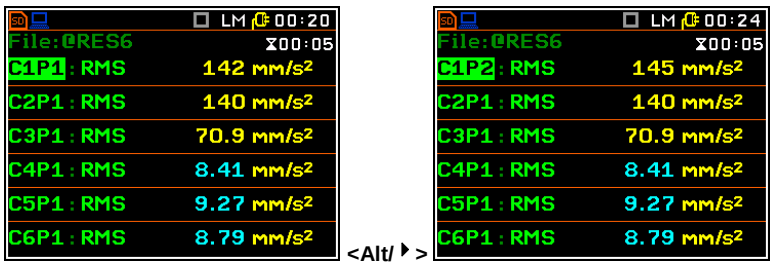
Displays in 6 Channels presentation mode

1. Result line for Channel 1.
2. Result line for Channel 2.
3. Result line for Channel 6.
4. Function name: **RMS**, **VDV**, **CRF**, **OVL**, **TIME**, **PEAK**, **P–P** and **MTVV**.
5. File name when **Auto Save** function is activated (*path: <Menu> / File / Save Options*)
6. The value of measured function and units of measured value.
7. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Meas. Cycle Time**].
8. The Overload or Underrange indicator.

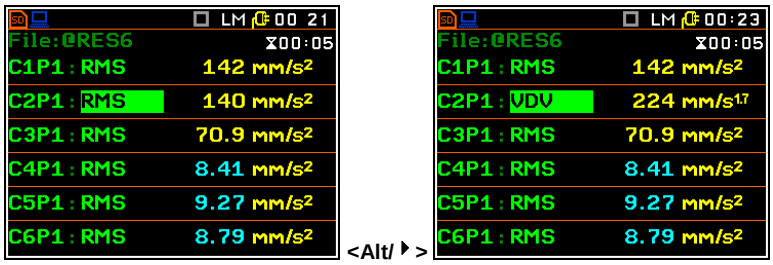
The change between position is made by pressing the **<▲>** , **<▼>** or **<◀>** , **<▶>** push-buttons. When Channel or Function position is chosen, then the profile number or function name is changed after pressing the **<◀>** or **<▶>** push-buttons in conjunction with the **<Alt>** one.



Position changing

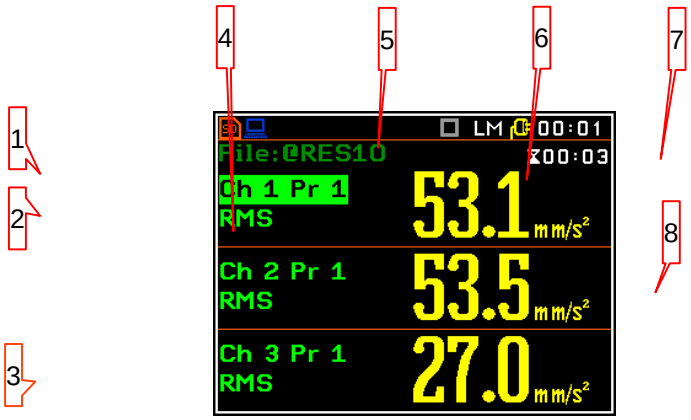

File:@RES6
C1P1 : RMS 142 mm/s²
C2P1 : RMS 140 mm/s²
C3P1 : RMS 70.9 mm/s²
C4P1 : RMS 8.41 mm/s²
C5P1 : RMS 9.27 mm/s²
C6P1 : RMS 8.79 mm/s²
<Alt/▶>
File:@RES6
C1P2 : RMS 145 mm/s²
C2P1 : RMS 140 mm/s²
C3P1 : RMS 70.9 mm/s²
C4P1 : RMS 8.41 mm/s²
C5P1 : RMS 9.27 mm/s²
C6P1 : RMS 8.79 mm/s²

Profile changing



Function name changing

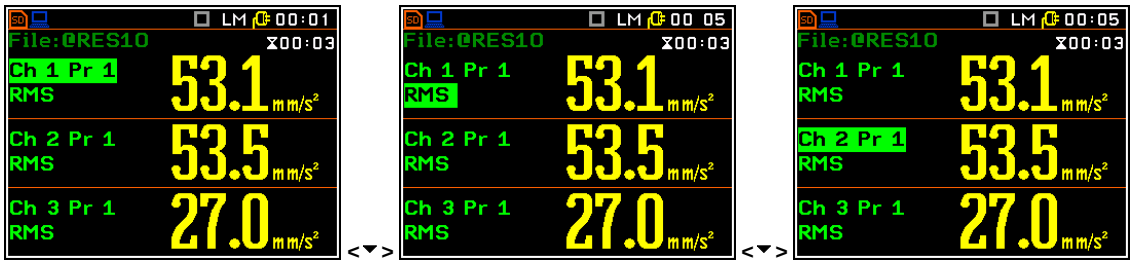
Fields description of the **3 profiles** view



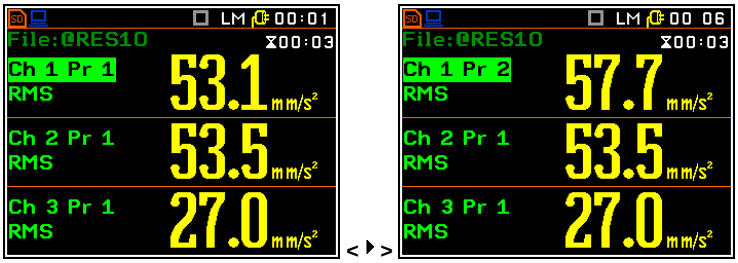
Displays in 6 Channels presentation mode

1. Line for first result.
2. Line for second result.
3. Line for third result.
4. Function name: **RMS**, **VDV**, **CRF**, **OVL**, **TIME**, **PEAK**, **P–P** and **MTVV**.
5. File name when **Auto Save** function is active (*path: <Menu> / File / Save Options*)
6. The value of measured function and units of measured value.
7. Elapsed time shows the current second of the measurement. The value presented there belongs to the range [**1**, **Integration Period**].
8. The Overload or Underrange indicator.

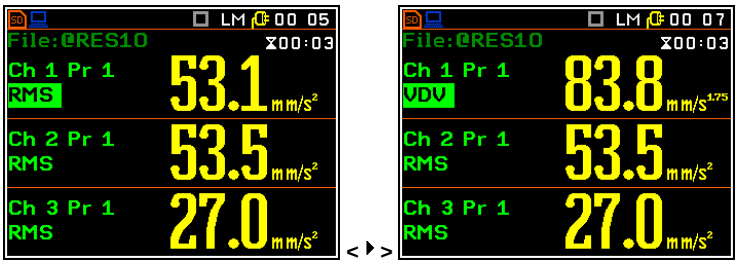
The change between position is made by pressing the **<▲>** , **<▼>** push-buttons. When Channel or Function position is chosen, then the profile number or function name is changed after pressing the **<◀>** or **<▶>** push-buttons in conjunction with the **<Alt>** one.



Position changing



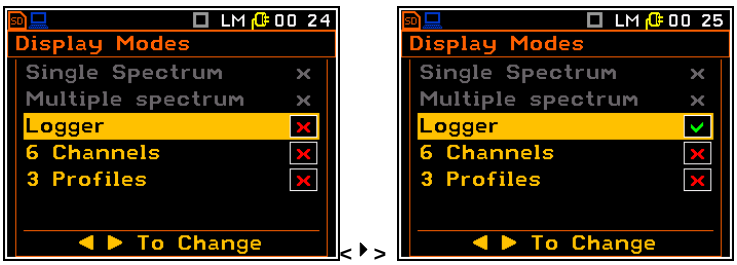
Profile changing



Function name changing

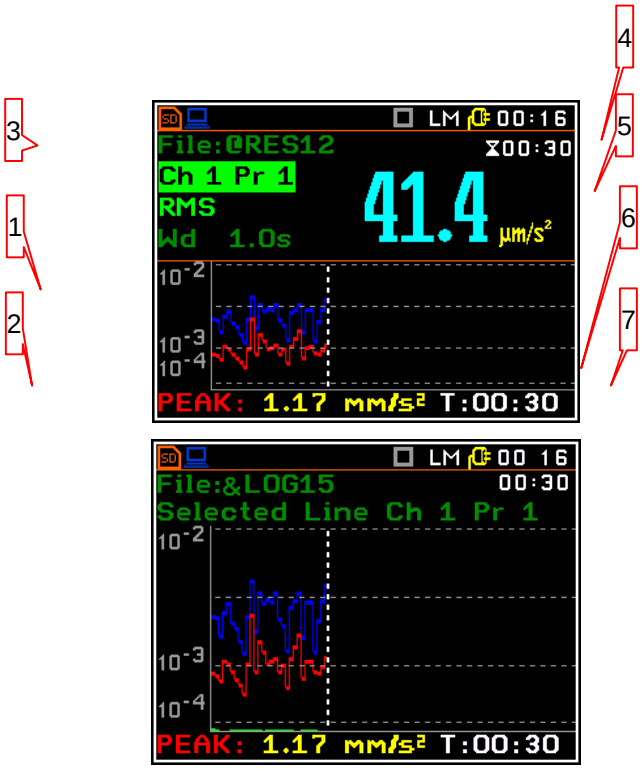
6.1.3 Setting on/off logger view – Logger

The history of results saved in the logger can be presented in the special **Logger** mode. The **Logger** mode can be activated or deactivated in the **Display Modes** window.



Activation of Logger presentation mode

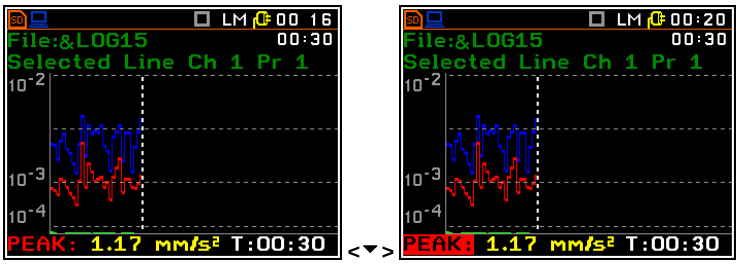
Fields description of the **Logger** view



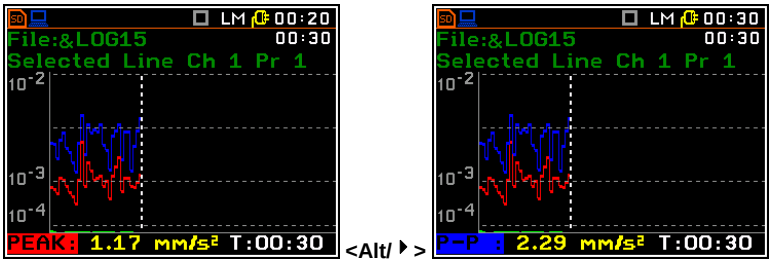
Display in Logger mode

1. Logger plot
2. Name of the logged result
3. Name of the logger file
4. Elapsed time
5. Cursor position
6. Result value for the cursor position
7. Cursor position

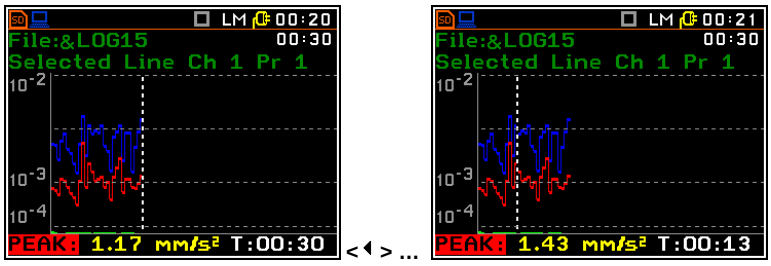
The user may change the cursor position by means of the **<◄>**, **<►>** push-buttons when the elapsed time field is active. The time field activation can be done after pressing the **<▲>** or **<▼>** push-buttons. The appropriate value is presented in the line below the plot.



Result field activation



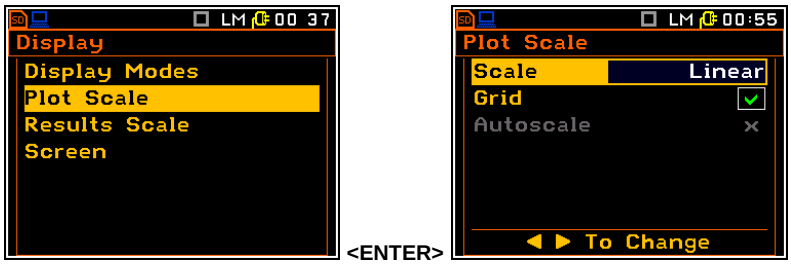
Result field activation



Change the cursor position for the logger plot

6.1.4 Setting the result presentation parameters – Plot Scale

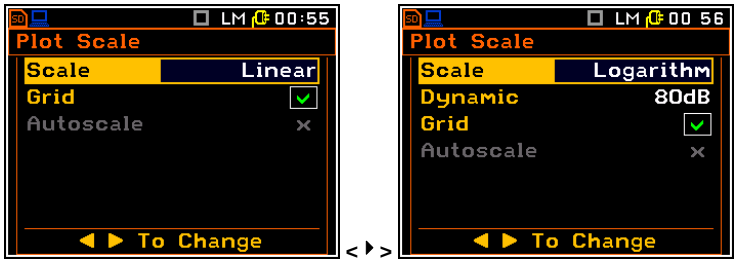
The **Plot Scale** sub-list enables the user to change the plot scale of results presentation.



Plot Scale window opening

Setting the scale of the measurement results presentation – **Scale**

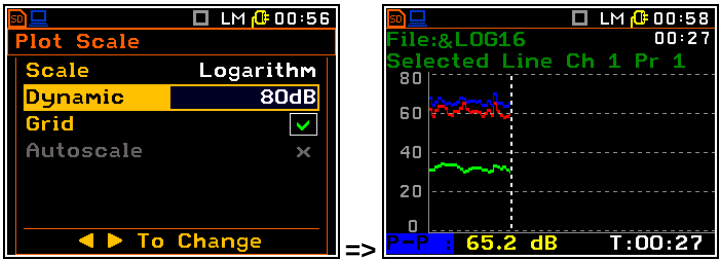
Two options are available: **Linear** and **Logarithm**. In the case of the first one the graphical presentation and the units both are linear. In the latter case the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Levels** (*path: Menu / Auxiliary Setup / Reference Levels*).



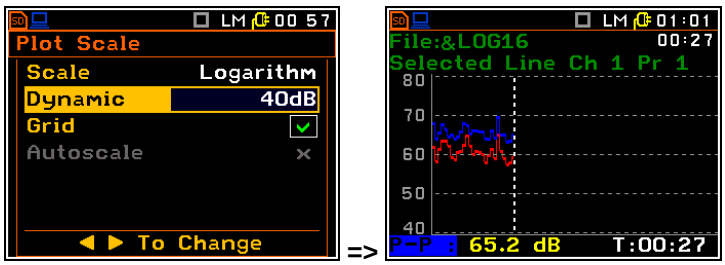
Plot Scale window; Scale selection

Scaling the vertical axis of the graphical mode presentation – **Dynamic**

The **Dynamic** position appears when the **Logarithmic** value of **Scale** parameter was chosen. The **Dynamic** parameter enables the user to select the proper scaling of the graphical mode presentation. In the case of the vertical axis one can obtain the double, four times and eight times expansion (as the default the vertical axis corresponds to **80 dB**, after expansion it corresponds to **40 dB**, **20 dB** and **10 dB** – respectively).



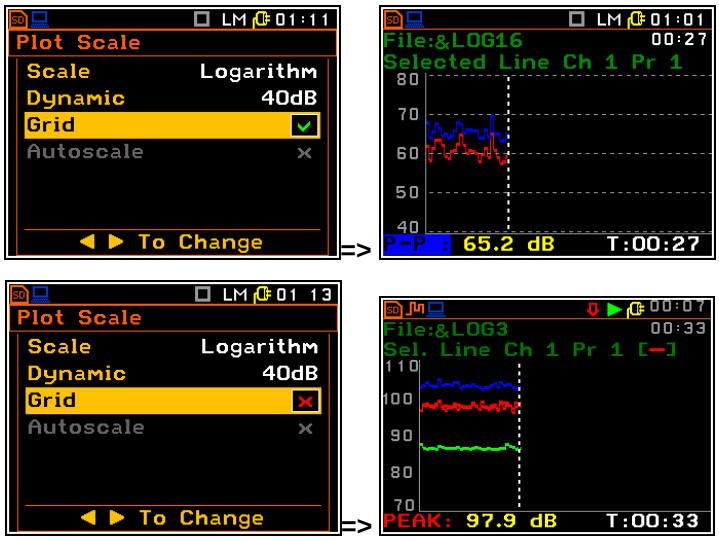
Logger wiev with Dynamic parameter 80 dB



Logger wiev with Dynamic parameter 40 dB

Switching on/off the grid in the graphical mode presentation – **Grid**

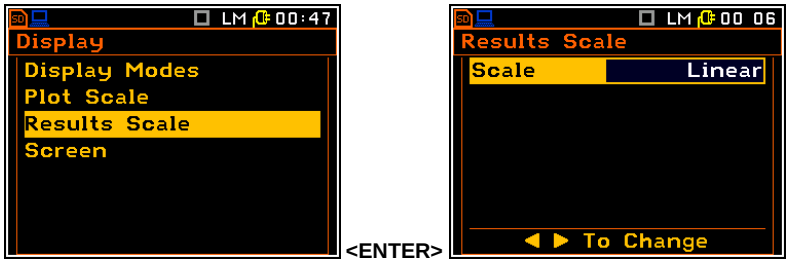
The **Grid** enables the user to switch on or off the grid in any graphical presentation.



Displays with the grid switched on and off

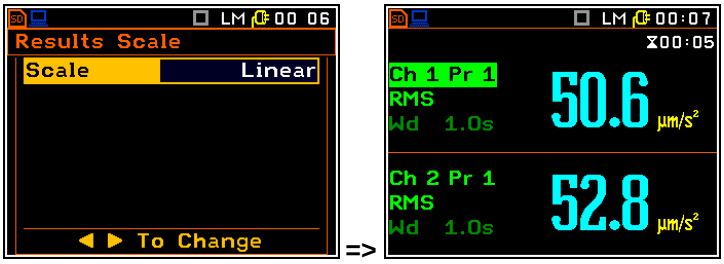
6.2 Setting the scale of result's presentation– Results Scale

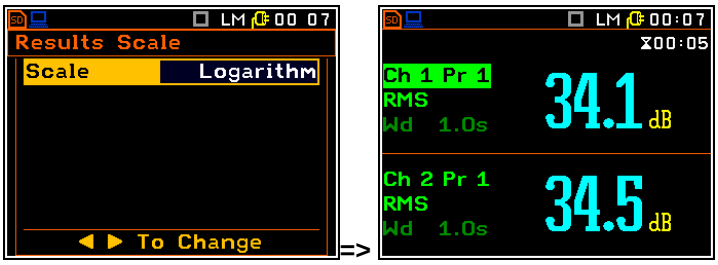
The **Results Scale** sub-list enables the user to change the scale in the available modes of the measurement results.



Results Scale window opening

There are two options for **Scale** parameter: **Linear** and **Logarithm**.

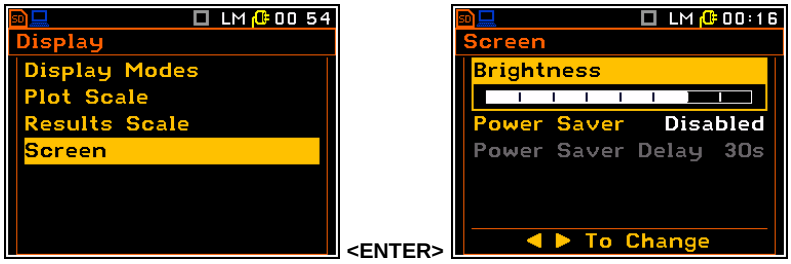




Results presentation in linear and logarithmic scale

6.3 Setting the display brightness and power saver- Screen

The **Screen** window enables the user to set the brightness of the display and switch on the screen saver.

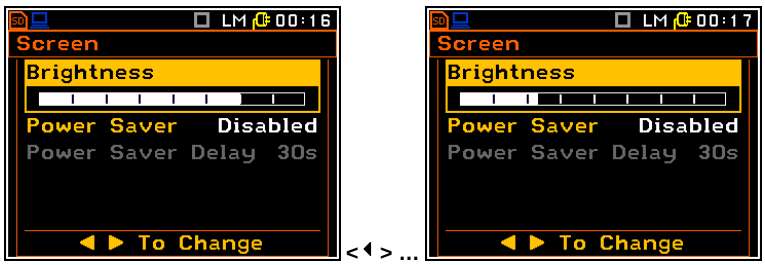


Display list; the Screen window opening

Setting the brightness of the display – **Brightness**

The **Brightness** enables the user by means of the **<◀>**, **<▶>** push-buttons to set the proper brightness of the display. The user can select 20 different values of this parameter.

***Notice**: The new value of the brightness is confirmed after each pressing of the <◀> or <▶> push-buttons (new value is selected without any confirmation from the **<ENTER>** push-button).*

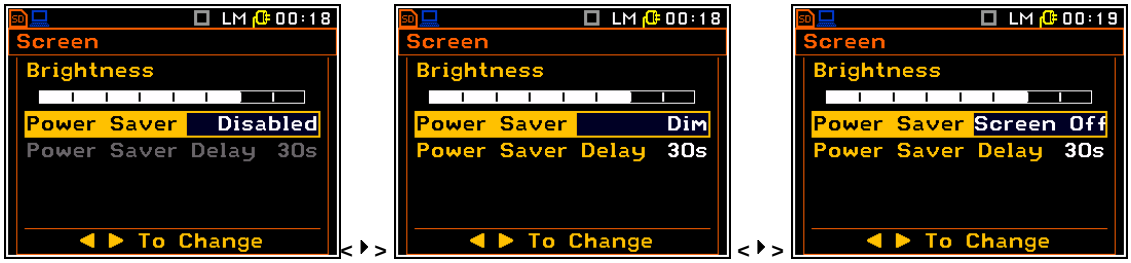


Screen windows; the change of the brightness

Setting the power saver function – **Power Saver**

The saving of the internal source of the instrument's power can be achieved by means of reducing the brightness of the screen when possible.

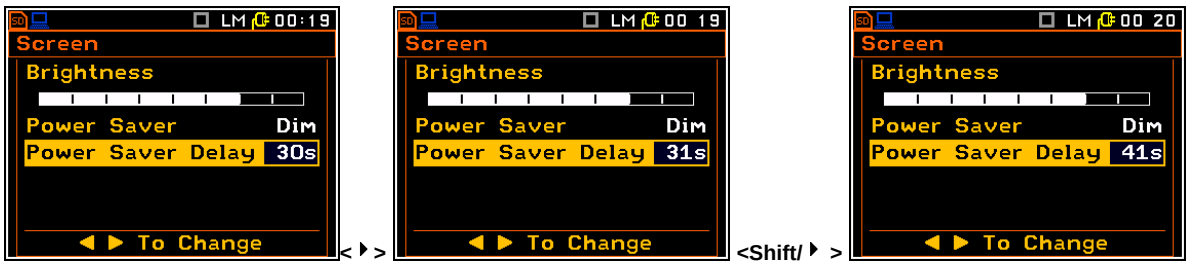
It is possible to set the **Power Saver** automatically. The screen may be switch off (**Screen Off**) or dimmed (**Dim**). In the case when any of these options is set, after 15 seconds from pressing **any push-button** the screen is switched off or dimmed. If it happened, the first pressing of any push-button would cause the switch on of the screen. **Power Saver** function may also be deactivated if **Disabled** parameter is selected.



Screen windows; the Power Saver parameter selection

Setting the power saver delay - **Power Saver Delay**

The **Power Saver Delay** defines the delay period from last use of any push-button to the Power saver mode. This delay period can be set from **5 s** to **60 s** .



Screen windows; the Power Saver after parameter selection

7 SAVING THE MEASUREMENT RESULTS – File

The registration of the measurement results is an essential task for the efficient use of the instrument. All available measurement results and also instrument's settings are stored as a file in the internal FLASH type memory of the instrument or on the external **SD Card** memory.

Instrument's files containing data:

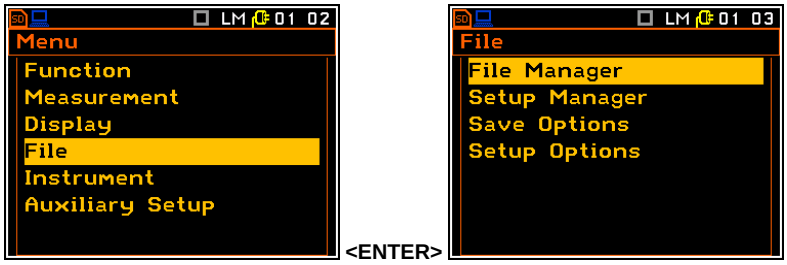
- from **Level Meter**;
- measurement results from 1/1 Octave analysis;
- measurement results from 1/3 Octave analysis;
- stored in the logger file,
- stored in the wave file,
- settings.

Result files can be saved manually or automatically, Setup files are saved manually, Logger and Wave files are saved automatically.

Each file consists of some elements, which are the same for all kind of files:

- a file header;
- the unit and software specification;
- the user's text stored together with the measurement data;
- the parameters and global settings;
- the special settings for profiles;
- the marker of the end of the file.

Notice: *The detailed description of all types of file structures is given in the Appendix B.*



Main list; File window opening

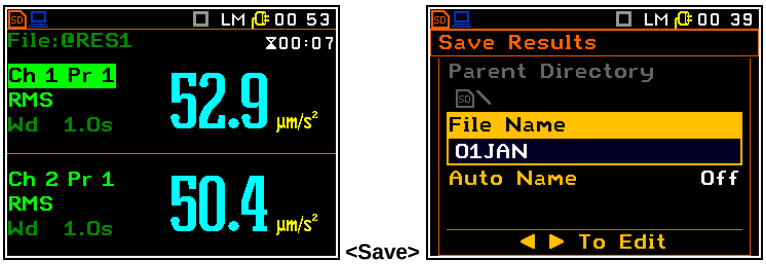
The **File** list contains the following items:

File Manager	enables one to manage the files saved in the instrument's or on external memory;
Setup Manager	enables one to manage the Setup files;
Save Options	enables one to set the options of the measurement result savings.
Setup Options	enables one to set the options of the setup savings.

7.1 Saving files in the instrument's memory or external memory

There are two options for storing result data in the internal or external memory. One option is to press **<Save>** push-button right after the measurement performance. Another option is to create **<New File>** in the **File Manager**. This option is described below.

After pressing the **<Save>** push-button the **Save Results** window appears.



Save Results window opening

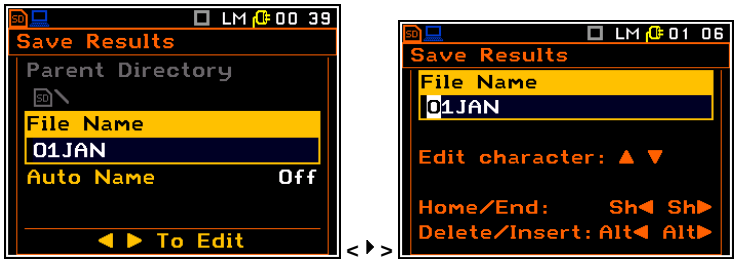
There are two available options for saving files: with the edited name, or with the name automatically changed with the name increased by one. These options can be selected in the position **Auto Name**. If **Auto Name** is switched off (**Off**) the name of the saved file is like in the position **File Name**. This file name can be edited in the special window, which is opening by means of **< ▸ >** push-button. When the **Auto Name** function is set on **Number**, then a file is saved with the name as displayed above, but after the last non-numeric letter of the text there will be added digit 0. If there already exists any chain of digits on the end of the file text the number that these digits create will be increased by one.

The number can be changed from 0 to N. The only limitation of the N value is the length of the file name, which cannot be longer than eight characters. In the case, when such limitation is achieved and the instrument can not change automatically the file's name the only possibility is to edit new file name.

The default name for a file is displayed in the case of the first entering to this position (after power on). The default name consists of the day and the month's abbreviation and cannot exceed 8 characters.

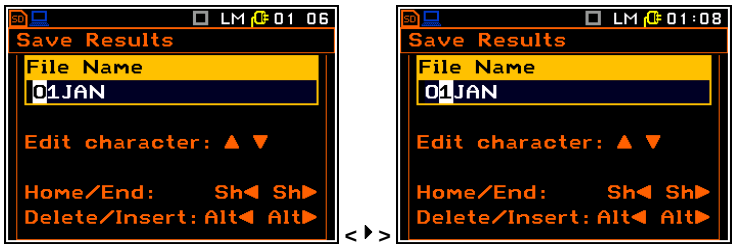
The user can skip the file's name edition and start saving file pressing the **<ENTER>** push-button or return to the **File** list or measurement display by pressing the **<ESC>** one.

To start file edition the user has to select the File name position and to press **< ◂ >** or **< ▸ >** push-button. After that the special window with edition function is opening. The edition process is presented on the Figure below.



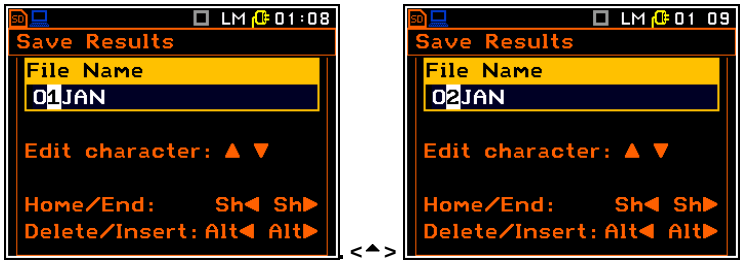
Opening the File edition window

One can select the position of the character in the edited text using the **< ◂ >**, **< ▸ >** push-buttons. For the current position the character can be changed, position can be deleted or inserted.



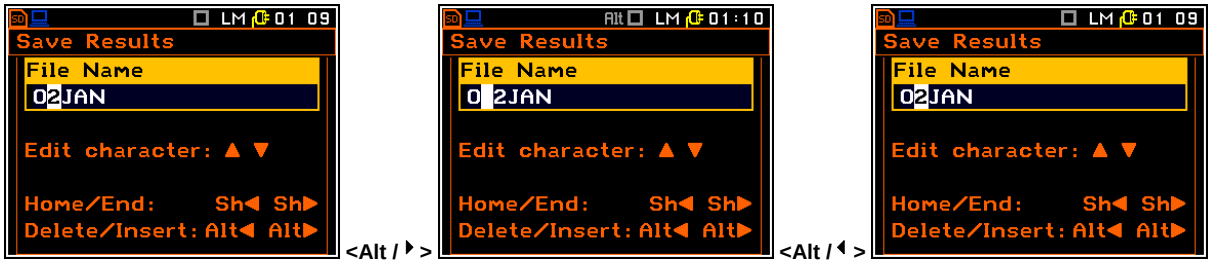
Selection of the character's position to be edited

The available ASCII characters can be changed using the **<▲>** (or **<▼>**) push-button. The subsequent digits, letters and other characters appear on the display in the inversely displayed position after each pressing of the mentioned above push-buttons.



Changing the edited character

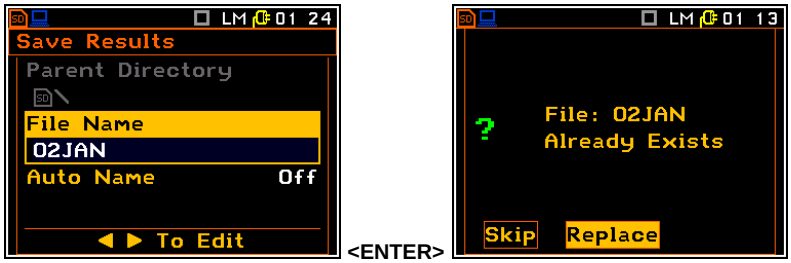
One can delete or insert the position in the edited text using the **<◀>**, **<▶>** push-buttons, pressed together with the **<Alt>** one.



Position insertion, deletion

The edited name is accepted and the instrument returns to the **Save Results** window after pressing the **<ENTER>** push-button. The second pressing of the **<ENTER>** push-button saves the file in the working directory. The special warning is displayed in the case the file with the edited name already exists in the memory. The instrument waits then for a reaction of the user (any push-button should be pressed except the **<Shift>** or the **<Alt>** one).

Saving the new file



File with such name already exists in the assigned catalogue

Notice: *The files can be overwritten (the use of the same file name) without any warning if the* ***Replace*** *option is switched on (path: <Menu> / File / Save Options).*

The saving is not possible in the case when the instrument is measuring the signal. The message "Measurement in progress!" is displayed for about 3 seconds.

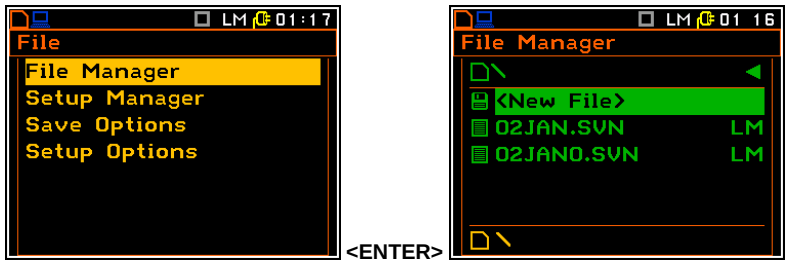
The presented below message is displayed after trying to execute the save operation in the case when no measurements were performed and there are no results to be saved. The instrument then waits for the reaction of the user (any push-button should be pressed except the **<Shift>** or the **<Alt>** one) and after pressing a push-button it returns to the **Save Results** window.

Display after the Save operation when there are no results for storing

Notice: *The direct access to the* ***Save Results*** *window is possible after pressing simultaneously the* ***<ENTER>*** *and* ***<Alt>*** *push-buttons if the* ***Auto Save*** *option is switched off (path: Menu / File / Save Options). In another case, (****Auto Save*** *option is switched on) the results are saved, after pressing these push-buttons, in the file with the automatically incremented name.*

7.2 Managing the files saved in the internal and external memory – File Manager

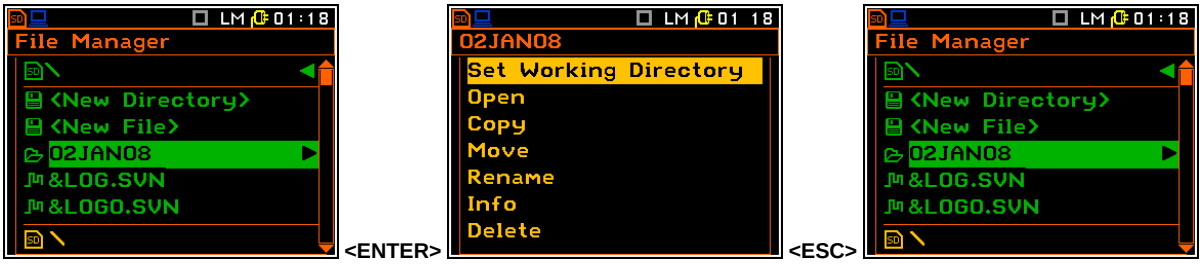
The **File Manager** is used for checking the contents of the memory and make operation on result and logger files such as: open, delete, copy, move, rename, create new files or catalogues and display file and catalogue information.



File Manager window opening

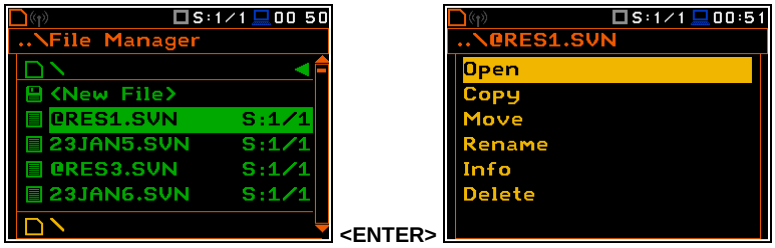
In the **File Manager** window the list of files, catalogues and memory devices is presented. Files are stored in catalogues, which are organised hierarchically. Catalogues names are of capital letters and have no extensions. It is possible to jump through positions in the list by means of the **<▲>**, **<▼>** push-buttons. By pressing the **<ENTER>** push-button the window with the list of available operations is opening for marked (highlighted) position. The window with list of operations is closed and the instrument returns to the **File Manager** list after pressing the **<ESC>** push-button.

When **SD Card** is selected the first two positions **<New Directory>** and **<New File>** can be used to create new elements. When **Internal** memory is selected the only **<New File>** position is available.

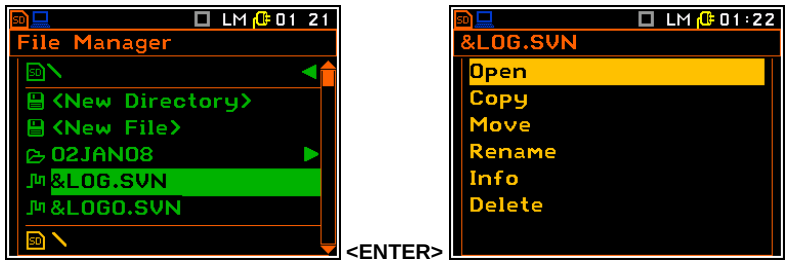


List of operations for the directory

The list of operations on files saved in the **Internal** memory differs from that one for the **SD Card** by one position. It is not possible to rename the files saved in the **Internal** memory and thus **Rename** position in this list is not active.

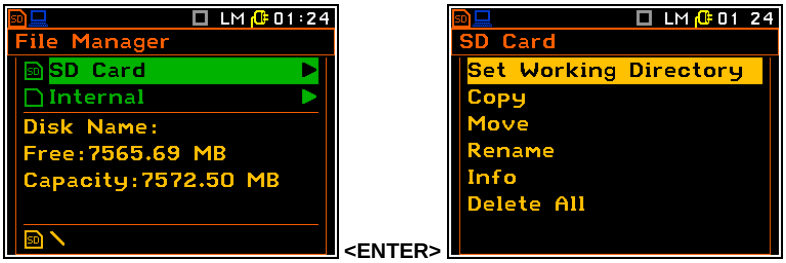


List of operations for the file saved in the Internal memory



List of operations for the file saved on the SD Card

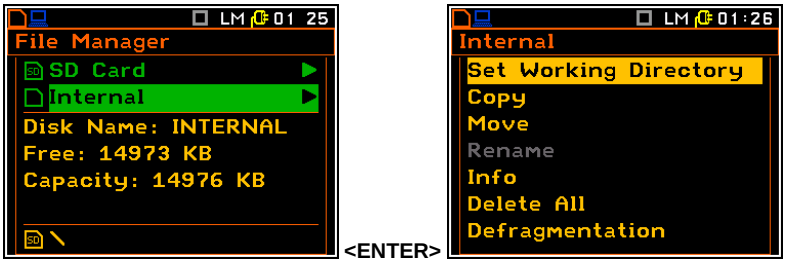
When the memory disk is selected after pressing the **<ENTER>** push-button the list of operations on disk appears.



List of operations for SD Card memory

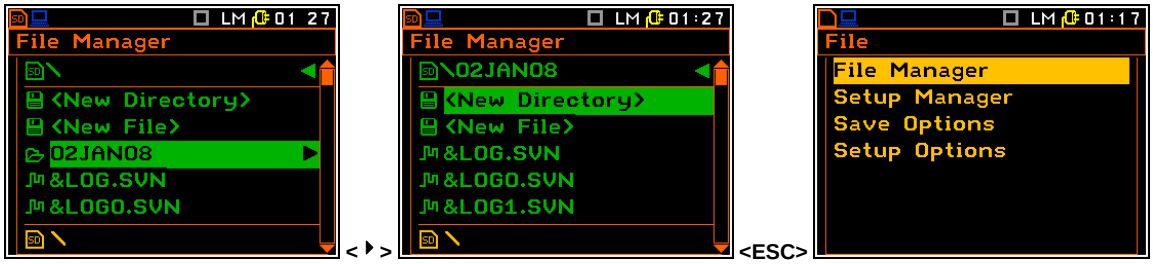
If **SD Card** is not installed it's position in the **File Manager** window became unavailable.

The list of operations on the **Internal** memory differs from that one for the **SD Card** by one position. It is not possible to rename the **Internal** memory and thus **Rename** position in this list is not active. The **Internal** memory can be also defragmentated and this is performed by operation **Defragmentation**.



List of operations for the Internal instrument memory

The selected catalogue can be opened by two ways: after pressing the **< ▸ >** push-button or after opening the operation list by means of **<ENTER>** push-button, then selection the position **Open** and pressing the **<ENTER>** push-button once again. The **File Manager** window is closed and the instrument returns to the **File** list after pressing the **<ESC>** push-button.



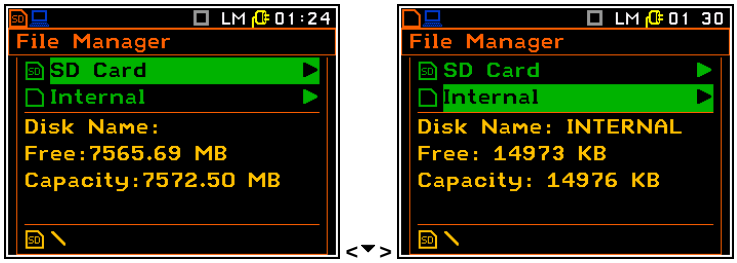
Catalogue opening and returning to the File window

Catalogue opening by means of Open operation

To return to the upper catalogue the user has to press the **< ◀ >** push-button.

Returning to the upper catalogues

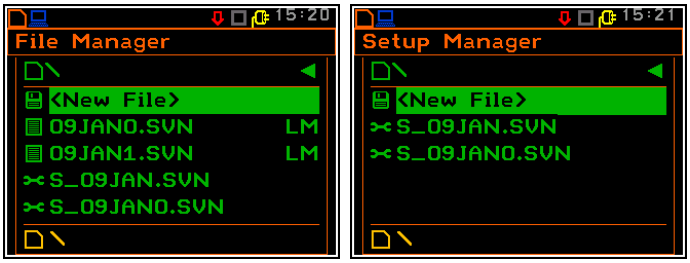
The upper (highest) catalogue contains the names and icons of memories available for files: **SD Card** and **Internal**. The description of the memory is presented below the memories list: **Disk Name**, **Free** memory and **Capacity** (total memory space).



Selection of the memory

In the **File Manager** window files are described by file name with extension (**SVN** or **WAV**) as well as additional icon and measurement abbreviation (SLM, S:1/1 etc.). The names in which the first character is @ are coming from the **Auto Save** function. Below the table with the description of icons is presented.

	Catalogue icon
	Logger file icon
	Wave file icon
	Result file icon
	Setup file icon
	New file or catalogue



Examples of file lists

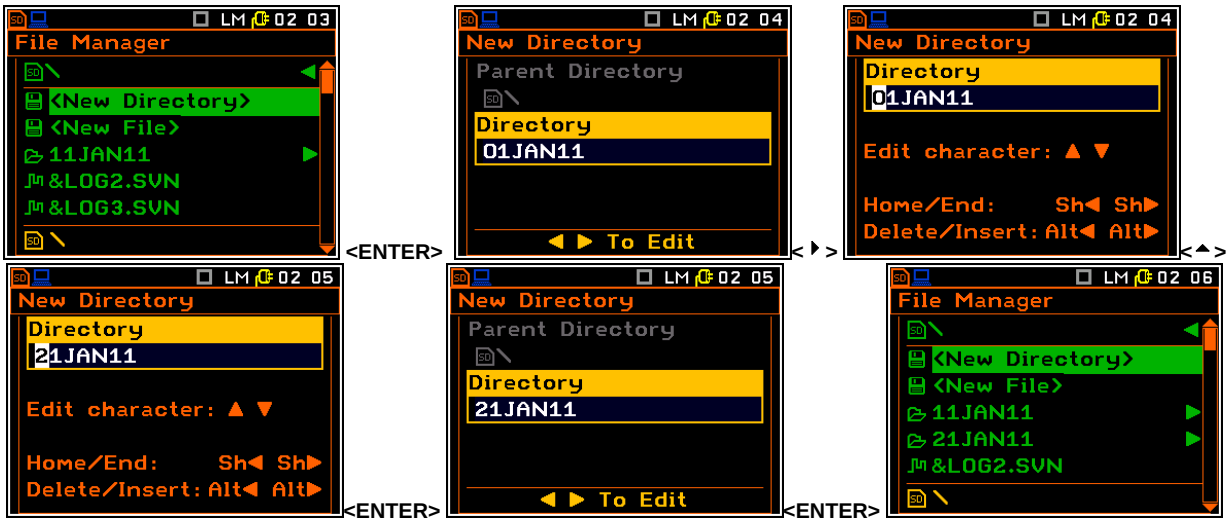
7.2.1 Setting the directory for saving files – Set Working Directory

It is possible to assign the catalogue for automatic saving logger files and result files. In order to do this one should choose the required catalogue and press the **<ENTER>** push-button. After opening the list of operations one should press the **<ENTER>** push-button and **Set Working Directory** operation will be performed. The new catalogue name will appear at the bottom line of the display. Starting from this moment all files will be saved in this catalogue.

Setting the new working catalogue for saving files

7.2.2 Creating new catalogue and new file

It is possible to create new catalogue in the file system on **SD Card**. In order to do this one should enter the catalogue in which the new one will be created and press the **<ENTER>** push-button at the **<New Directory>** position. The proposition of new catalogue name will appear at the bottom line of the display. If there already exists a directory with such name the warning message will appear. In other case this operation will be performed.

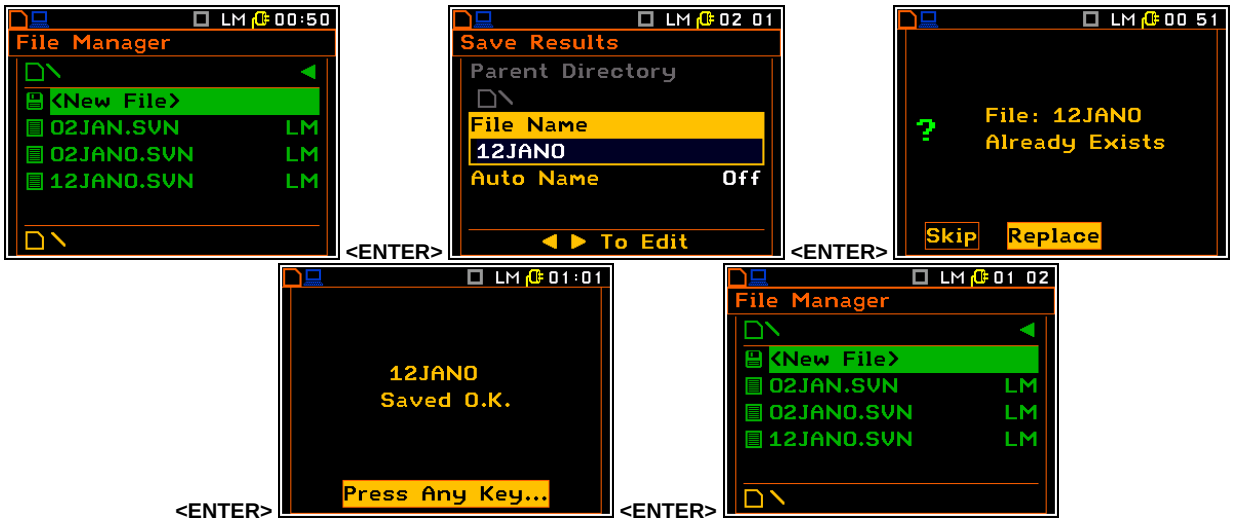


Creating the new catalogue

There is another than pressing the **<Save>** push-button way of saving results as a file in the internal or external memory. This can be done in the **File Manager** window by creating new file in the file system. In order to this one should enter the catalogue in which the new file will be created and press the **<ENTER>** push-button at the **<New File>** position.

Creating the new file

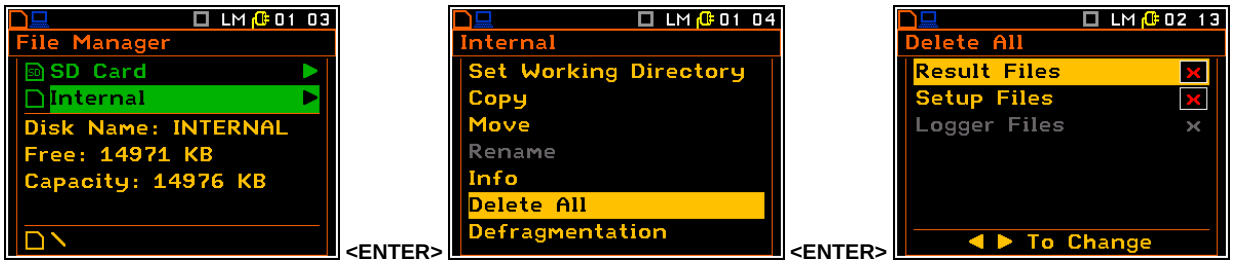
If there already exists a file with such name the warning message will appear.



Attempt to create the new file with existing name

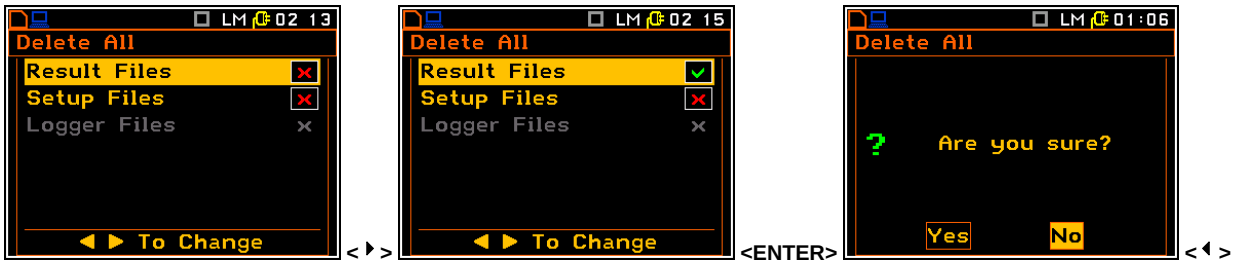
7.2.3 Deleting all files from Internal memory – Delete All

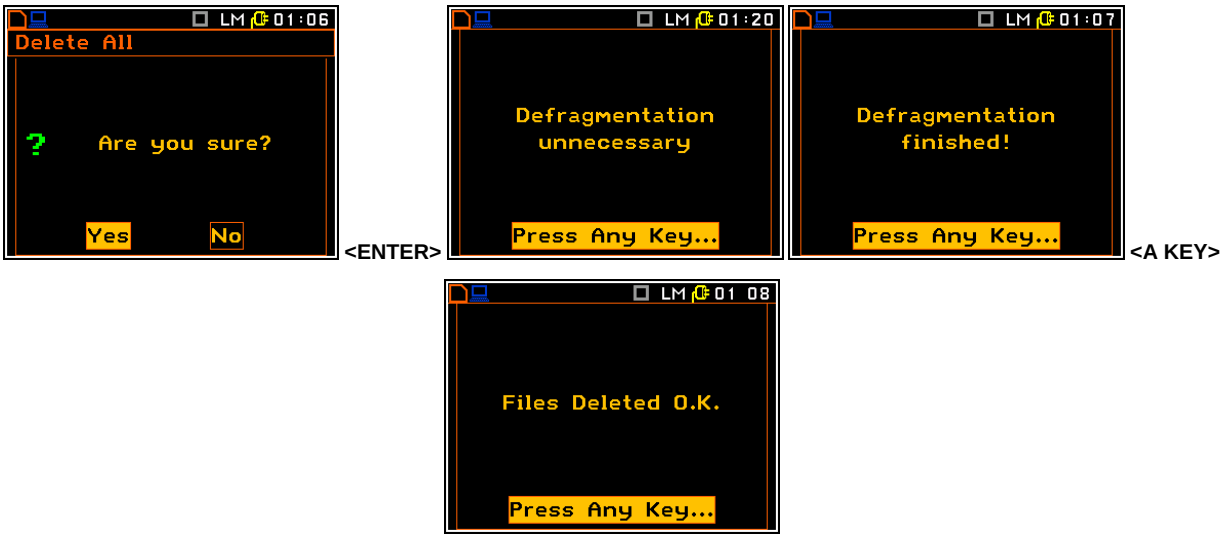
It is possible to delete all result and/or setup files from the **Internal** instrument's memory. In order to do this one should select the **Internal** memory and press the **<ENTER>** push-button. After opening the list of operations one should select with the **<▲>, <▼>** push-buttons the **Delete All** position and press the **<ENTER>** push-button again. The **Delete All** window with the list of file types will be opened.



Delete All window for Internal memory

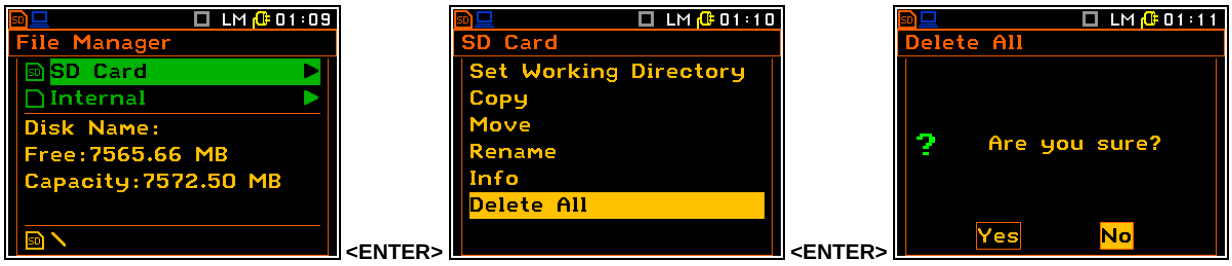
To delete files the user shall mark the desired file type then press the **<ENTER>** push-button.





Result Files deleting

It is possible to delete all files from the **SD Card** memory. In order to do this one should select the **SD Card** memory and press the **<ENTER>** push-button then confirm the operation.



Delete All window for SD Card

7.2.4 Merging result and setup files memory – Defragmentation

The **Defragmentation** is used to make the **Internal** memory continuous. All new files are saved starting from the beginning of the free memory space. The memory occupied by the deleted file remains unused for the next files saving. After the removing a file the files memory becomes discontinuous, with unused parts, which cannot be utilized in the future.

The situation changes after the process called defragmentation. During this process, the files saved in the files memory are moved in order to obtain the continuous occupied space.

Defragmentation operation selection

After pressing the **<ENTER>** push-button on the active **Yes** option, the instrument checks whether the used result and Setup files memory is continuous or not. If this memory is continuous, the **Defragmentation** operation is not executed and the special message is displayed. The instrument waits for the reaction of the user (any push-button should be pressed except the **<Shift>** and **<Alt>** one) and after pressing a push-button it returns to the **Defragmentation** sub-list.

Message in the case when the execution of the Defragmentation operation is unnecessary

If there are conditions to execute the **Defragmentation** operation the current progress of defragmentation is shown on the display. After the successful defragmentation, the special message is displayed and the instrument waits for the reaction of the user. Any push-button should be then pressed except the **<Shift>** and **<Alt>** one. After pressing a push-button, the instrument returns to the **Defragmentation** sub-list.

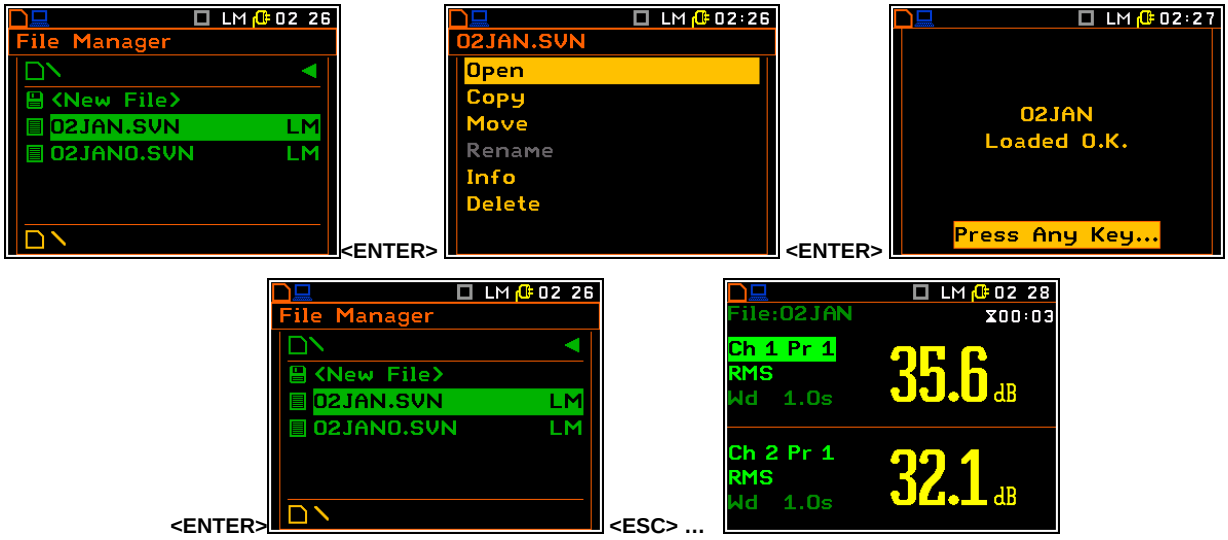
Execution of the Defragmentation operation

7.2.5 Opening file/catalogue – Open

It is possible to open file or catalogue from the file/catalogue list. In order to do this one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select with the **<▲>, <▼>** push-buttons the **Open** position and press the **<ENTER>** push-button again. The effect of such operation for the catalogue is the same as opening the catalogue by means of the **<▶>** push-button.

Opening the catalogue

Opening the measurement file means that the measurement results saved in this file will be loaded to the instrument's operation memory.

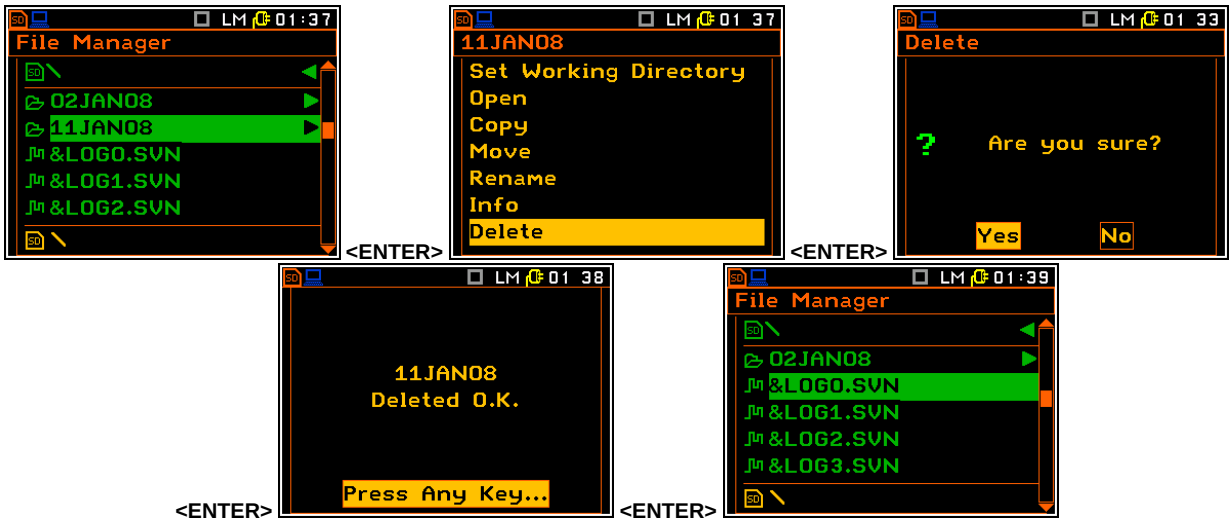


Loading the measurement file and return to the measurement screen with results saved in this file

7.2.6 Deleting file/catalogue – Delete

It is possible to delete file or catalogue from the file/catalogue list. In order to do this one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select with the **<▲>, <▼>** push-buttons the **Delete** position and press the **<ENTER>** push-button again.

Deleting the file



Deleting the catalogue

7.2.7 Copying file/catalogue – Copy

It is possible to copy file or catalogue from the file/catalogue list in one memory type to another. It is not possible to copy logger files to the **Internal** memory since this type of memory do not accept such files.

In order to do this operation one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select with the **<▲>, <▼>** push-buttons the **Copy** position and press the **<ENTER>** push-button again. The instrument then will propose to choose the target catalogue for copying. After selection of the target catalogue the user should press the **<ENTER>** push-button. The window with two options will appear: **Copy Here** and **Rename**.

Copying the file to the Internal memory

Copying the file to the external memory

7.2.8 Moving file/catalogue – Move

It is possible to move file or catalogue from the file/catalogue list in one memory type to another or from one catalogue of external memory to another catalogue same memory. . It is not possible to move logger files to the **Internal** memory since this type of memory do not accept such files.

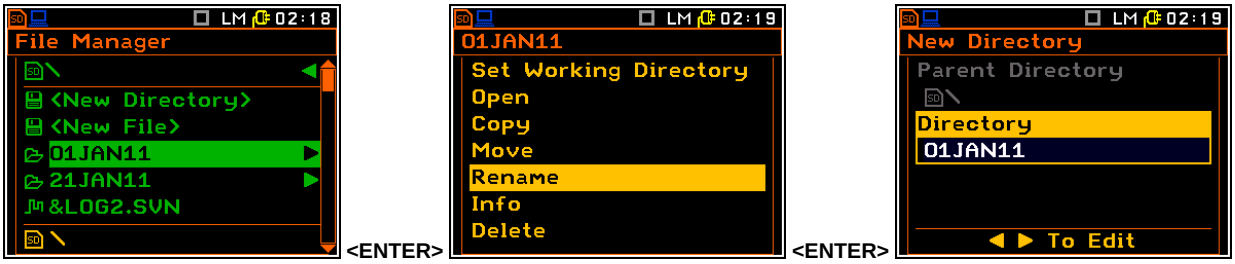
In order to do this operation one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select with the **<▲>, <▼>** push-buttons the **Move** position and press the **<ENTER>** push-button again. The instrument then will propose to choose the target catalogue for copying. After selection of the target catalogue the user should press the **<ENTER>** push-button. The window with two options will appear: **Move Here** and **Rename**.

Moving the file to the Internal memory

Moving file to the Internal memory

7.2.9 Renaming file/catalogue – Rename

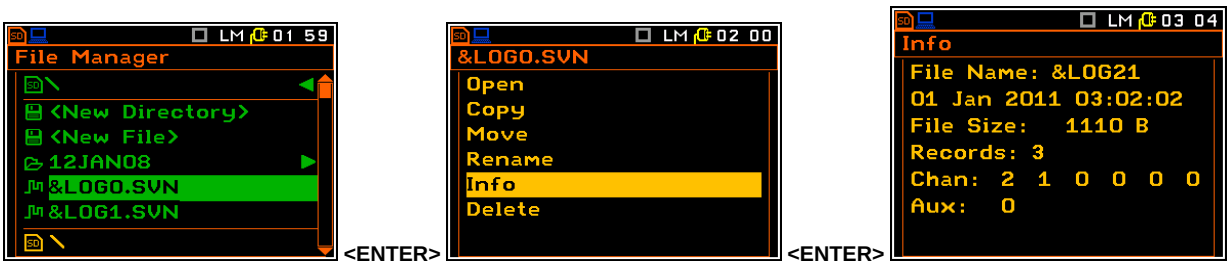
It is possible to rename file or catalogue. In order to do this one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select with the **<▲>, <▼>** push-buttons the **Move** position and press the **<ENTER>** push-button again. The instrument then will propose to choose the target catalogue for copying. After selection of the target catalogue the user should press the **<ENTER>** push-button. The window with three options will appear: **Copy Here**, **New Directory** and **Rename**.



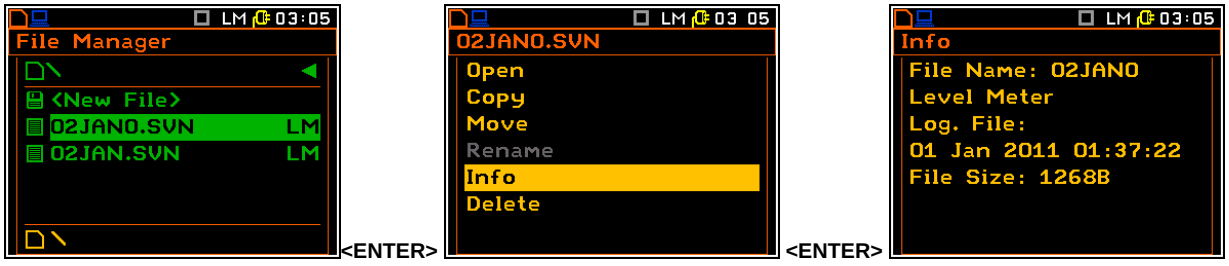
Renaming the catalogue

7.2.10 Information about file/catalogue – Info

It is possible to get information about file or catalogue. In order to do this one should select the file/catalogue and press the **<ENTER>** push-button. After opening the list of operations one should select with the **<▲>, <▼>** push-buttons the **Info** position and press the **<ENTER>** push-button again. The instrument then will display the information about selected file/catalogue.



Information about logger file

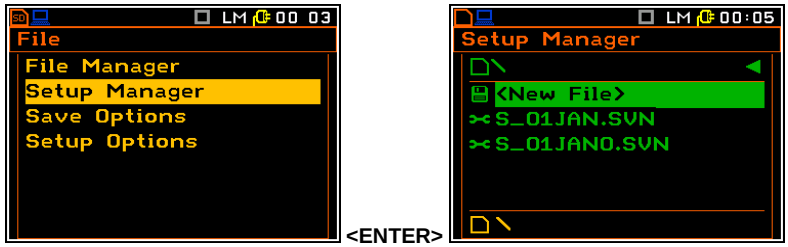


Information about result file

Information about catalogue

7.3 Managing the setup files – Setup Manager

The **Setup Manager** is used for checking the contents of the memory and make operation on Setup files such as: open, delete, copy, move, rename files, create new files and display file information.

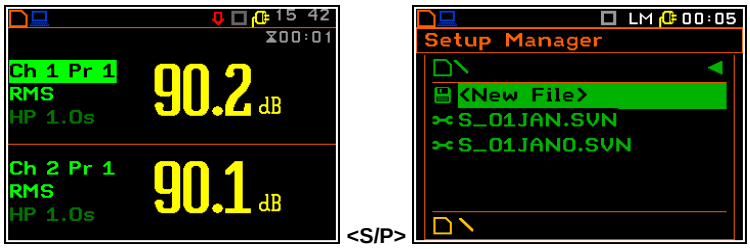


File list; Save Setup window opening

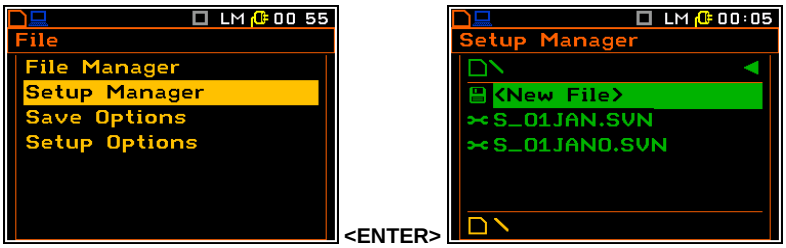
In the **Setup Manager** window only setup files are displayed. Setup files have extension **SVN** and icon attribute .

7.3.1 Saving the setup files

To store the setup data as a file in the internal or external memory one should open the **Setup Manager** window and push the **<ENTER>** push-button on the **<New File>** position. There are two options to open the **Setup Manager** window. One option is to press **<S/P>** push-button when the measurement is not performed. Another option is to open the **Setup Manager** position from **File** menu.



Setup Manager window opening by means of <S/P> push-button



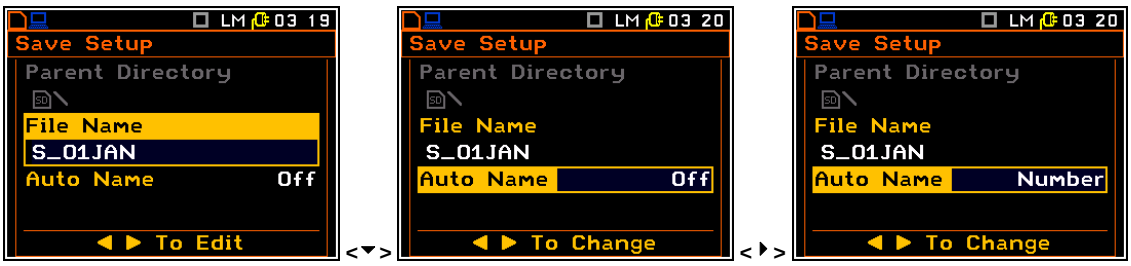
Setup Manager window opening from File menu

In order to save the setup file one should enter the catalogue in which the new file will be created and press the **<ENTER>** push-button at the **<New File>** position. **Save Setup** window is opening then.

The user may edit the file name, or use the simplified way of naming. When the **Auto Name** function is set on Number then a file is saved with the name as displayed, but after the last non-numeric letter of the text there will be added digit 0. If there already exists any chain of digits on the end of the file text the number that these digits create will be increased by one.

The number can be changed from 0 to N. The only limitation of the N value is the length of the file name, which cannot be longer than eight characters. In the case, when such limitation is achieved and the instrument can not change automatically the file's name the only possibility is to edit new file name.

The **Auto Name** function is setting up by means of the **<◀>**, **<▶>** push-buttons.

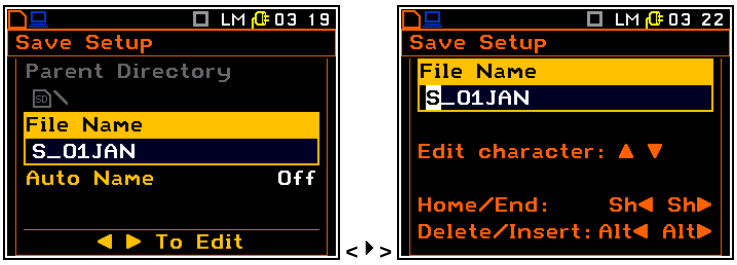


Save Setup window; Auto Name option selection

The editable name of the file, in which the setup settings are to be saved, is displayed in the **File Name** position. The default name for a setup file is displayed in the case of the first entering to this position (after power on). The default file name for Setup settings is **S_<Date>** (for example: **S_01JAN**).

The user can skip the setup file's name edition and start saving file pressing the **<ENTER>** push-button or return to the **File** list pressing the **<ESC>** one.

To start edit the file name one should press the **<▶>** push-button. The edition window will be opened.



Edition window opening

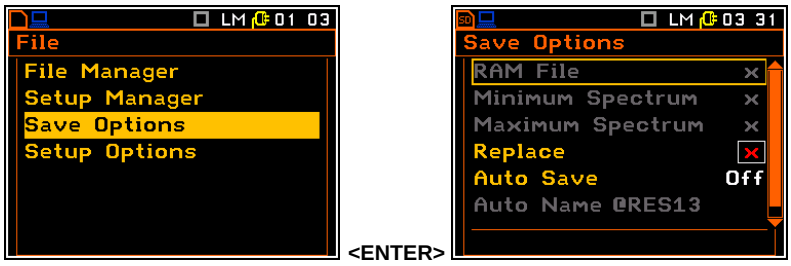
The edition process is the same as for any text and is described above.

The instrument attempts to save a file after pressing the **<ENTER>** push-button. The saving is not possible in the case when the instrument is measuring the signal. The special message is displayed for about 3 seconds in this case and the instrument returns to the **Save Setup** window.

It is not possible to store the data in the file, which already exists, when the **Replace** is not active (☒) (*path: <Menu> / File / Save Options*).

7.4 Controlling the data storing in the instrument's memory - Save Options

The **Save Options** sub-list is used for the selection of the options of data storing in the instrument's files.

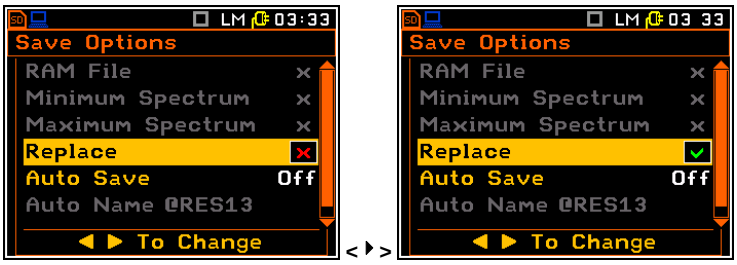


Save Options window opening

It is possible to replace the existing in the memory file by the new with the same name (**Replace**), to save automatically the results of the measurements (**Auto Save**), to save the results with the automatically incremented name (**Direct Save**).

Replacement of the existing files by the new ones – **Replace**

The result of the attempt to save the file with the name, which already exists in the memory, depends on the setting of the **Replace**. It is possible to erase the old file and to save the new one with the same name if the position is active (☑). The activation or deactivation of the **Replace** is done by pressing the **<◂ >**, **<▸>** push-buttons.



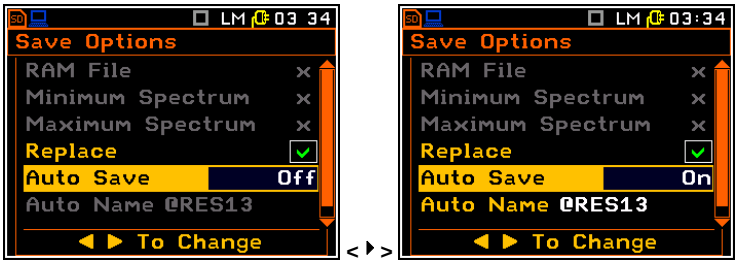
Save Options sub-list; Replace function activation

The message is displayed that such operation is not available in the case when this position is not active (☒) – cf. the description of the **Save**. In the other case, the existing file is overwritten.

Displays during the file saving when the Replace is switched off and on

Controlling the measurement results savings - **Auto Save**

Using the **Auto Save** one can set the self-saving of the measurement results with automatic number increment (**Number)** or to switch it off (**Off**). This position was also established in order not to waist too much memory of the instruments when the self-saving is not necessary.

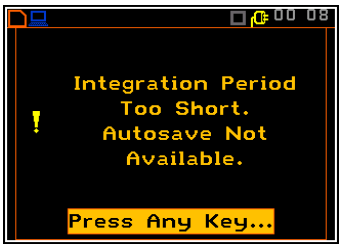


Save Options sub-list; Auto Save function activation

Notice: *The* ***Auto Save*** *function can be performed only in the case when the* ***Meas. Cycle Time*** *(path: Menu / Measurement / General Settings) is not less than 10 seconds. If it is less than 10 seconds, the measurement results are not saved without any indication of that fact! There is only one exception - when the* ***Repetition Cycles*** *(path: Menu / Measurement / General Settings) is equal to one, the* ***Auto Save*** *function is executed disregarding of the value of the integration period.*

The **Auto Name** position appears after switching on the **Auto Save** function.

When the **Meas. Cycle Time** is too short for switching on the **Auto Save** option or the **Repetition Cycles** is set to one the following message appears on the display:



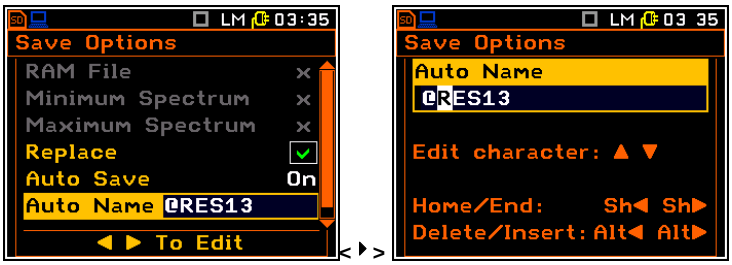
Display after attempt of switching on Auto Save option with too short Meas. Cycle Time

When the **Auto Save** option is active, after starting the measurements by pressing the **<Start/Stop>** push-button the results are saved in the file with the selected name.

Another measurement is started after next pressing of the **<Start/Stop>** push-button. The measurement is stopped after the selected **Measa. Cycle Time** (*path: Menu / Measurement / General Settings*). The name numbers of the next saved files are automatically incremented by one. The same remarks are valid in this case as it was already stated in the description of the **Save Next** function.

Edition the name of the Auto Save file – **Auto Name**

The **Auto Name** enables one to edit the name of the Auto Save file. To edit the file name the user has to press the **< ▸ >** push-button. The text edition window is opening.



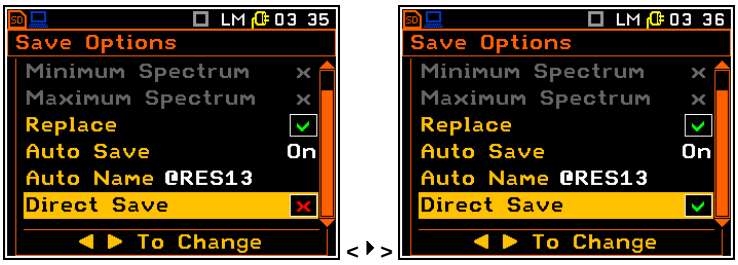
Auto Save file name edition

Direct access to the Save function - **Direct Save**

-

The **Direct Save** enables one to select the instrument's reaction on the simultaneous pressing of the **<ENTER>** and **<Alt>** push-buttons. If this option is not active (☒), after pressing these push-buttons the **Save** window is accessed (if the measurements are not performed).

If the option is active (☑), after pressing the **<ENTER>** and **<Alt>** push-buttons the results are saved in the file with the automatically incremented name and the proper message is displayed for a few seconds. The proper setting of the **Direct Save** is done by pressing the **< ◂ >**, **< ▸ >** push-buttons.

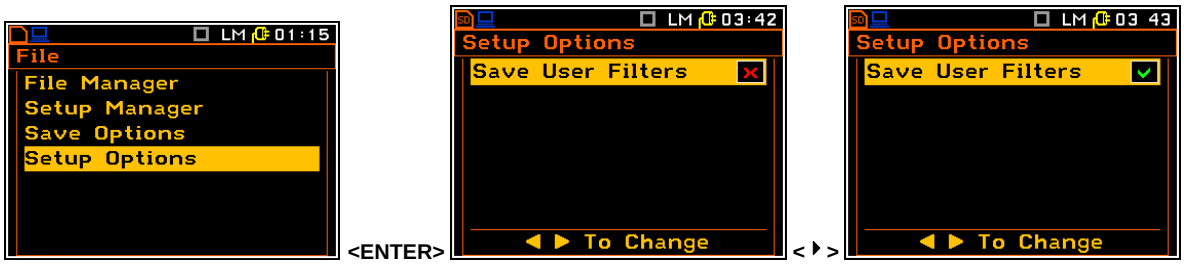


Save Options sub-list; Direct Save function selection

Press the **<ENTER>** and **<Alt>** push-buttons during the execution of the measurements causes, disregarding the option set in the **Direct Save**, that the message “Measurement in Progress” is displayed.

7.5 Options for setup files - Setup Options

The **Setup Options** sub-list is used for the selection of the options for storing setup files.

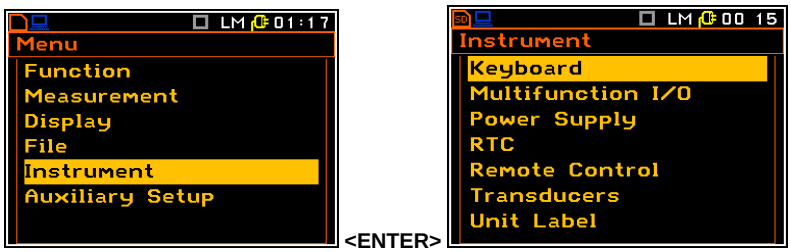


Setup Options window opening

The **Save User Filters** is used for saving the user filters together in the setup files.

8 SETTINGS OF THE INSTRUMENT PARAMETERS – Instrument

The **Instrument** list contains different sub-lists and positions, which are directly related with the settings of the hardware components of the instrument. In order to open the **Instrument** list one has to press the **<Menu>** push-button, select the **Instrument** text and press **<ENTER>**.



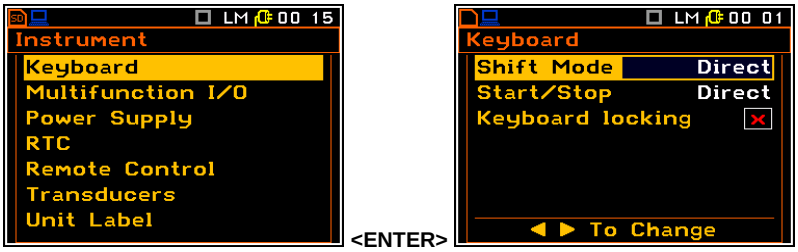
Opening the Instrument position Instrument list

In the **Instrument** list, the following items are available:

Keyboard	it enables the user to set the operating mode of the **<Shift>** and the **<Start/Stop>** push-buttons.
Multifunction I/O	it enables the user to select the available functionality of the I/O port.
Power Supply	it enables the user to check the powering source of the instrument.
RTC	it enables the user to set the Real Time Clock.
Remote Control	it enables the user to activate or deactivate error confirmation function.
Transducers	it enables the user to activate or deactivate the transducer's compensation.
Unit Label	it enables the user to check the type of the instrument, its serial number and the current software version installed in it and the standards, which the instrument fulfils.

8.1 Selection of keyboard modes – Keyboard

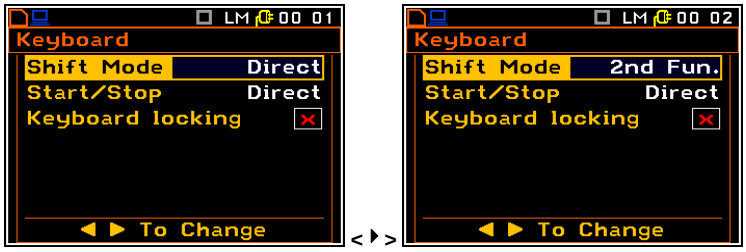
The **Keyboard** position enables the user to programme the operation mode of the **<Shift>**, **<Alt>** and **<Start/Stop>** push-buttons and switch on and off backlight and sound options.



Instrument list, the Keyboard window opening

<Shift> / <Alt> push-button working mode selection – **Shift Mode**

In the **Shift Mode** position the user can choose between **2nd Fun.** and **Direct**. When the **Direct** option is selected, the **<Shift>** and **<Alt>** push-buttons operates as in the keyboard of a computer – in order to achieve the desired result, the second push-button has to be pressed in conjunction with the **<Shift>/<Alt>** one. When the **2nd Fun.** option is selected the **<Shift>/<Alt>** push-button operates in the sequence with the other one.

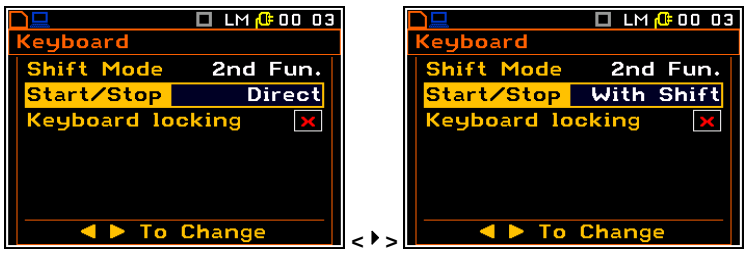


Keyboard Settings windows; the available Shift Mode settings

<Start/Stop> push-button working mode selection - **Start/Stop**

In the **Start/Stop** position the user can choose between **Direct** and **With Shift**. When the **Direct** option is selected the instrument reacts on each of the **<Start/Stop>** push-button pressing, starting or stopping the measurements.

When the **With Shift** option is selected the **<Start/Stop>** push-button operates in conjunction or in a sequence with the **<Shift>** one. The measurements are started or stopped after pressing both push-buttons.



Keyboard Settings windows; the available Start/Stop settings

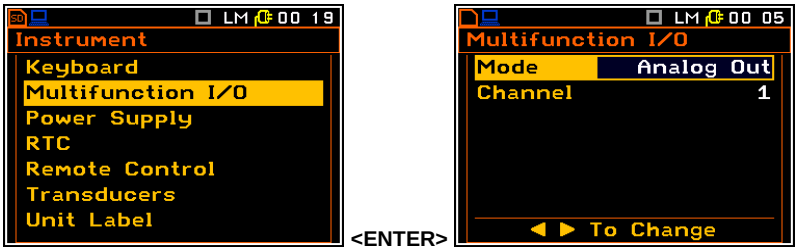
Locking the keyboard – **Keylock**

The **Keylock** position blocks the keyboard of the instrument.

Keyboard Settings windows; the Keylock settings

8.2 Setting parameters of the I/O port - Multifunction I/O

The **Multifunction I/O** enables the user to select the available functionality of the **I/O** port.



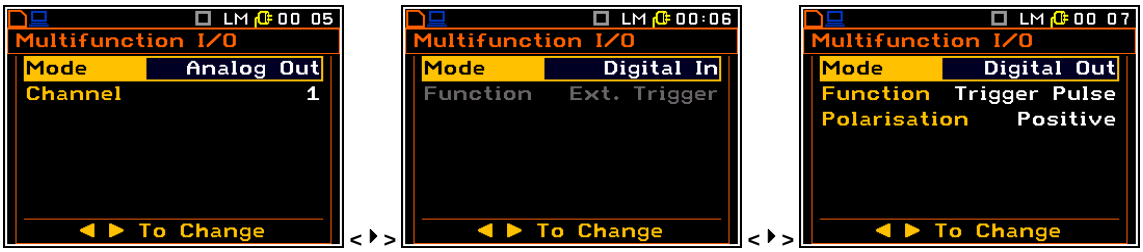
Instrument list, the Multifunction I/O setup window opening

Mode selection of the I/O port – **Mode**

In the **Mode**, it is possible to select the function of the instrument's socket named as **I/O**. This socket can be used as

- the output of the analogue signal (**Analog Out**) transmitted from the input of the instrument to its output without any digital processing (i.e. filtering),
- the input of the digital signal used as an external trigger to start the measurements (**Digital In**) in the "slave" instrument,
- the digital output (**Digital Out**) used for triggering other "slave" instrument from the "master" one,
- the source of any alarm signal in the case of certain circumstances occurred during the measurements (i.e. the level of the input signal was higher than selected one).

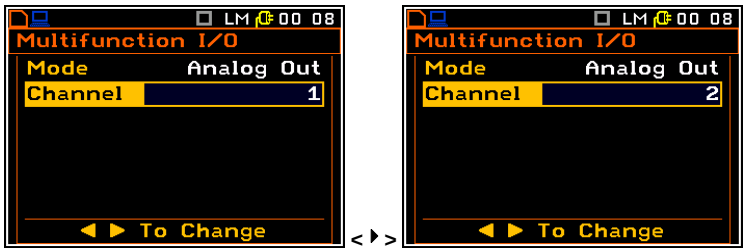
The more detailed description of the **I/O** is given in App. C.



Multifunction I/O windows; the Mode selection

Selection the channel for analog output – **Channel**

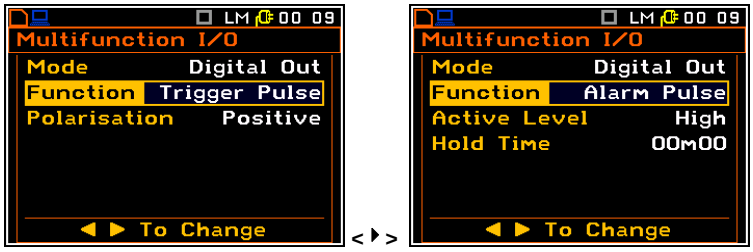
In the **Channel** position it is possible to select the channel which signal is assigned to the analogue out.



Multifunction I/O windows; the Channel selection

Digital output function selection of the I/O socket – **Function**

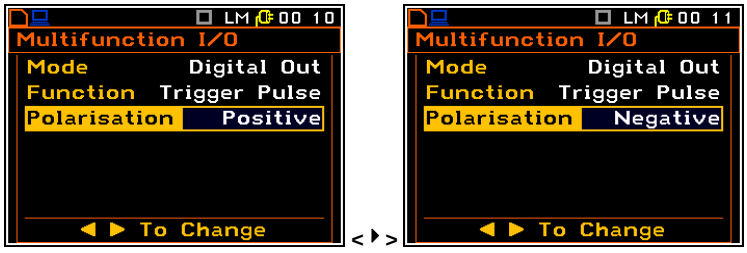
In the **Function** position**,** it is possible to set the function of the digital output of the **I/O** instrument's socket. The socket can be used as the source of the trigger pulse (**Trig. Pulse**) which starts the measurement in another "slave" instrument linked to the "master" one or the alarm signal which appears there after fulfilling certain measurement conditions (**Alarm Pulse**).



Multifunction I/O windows; the Function selection

Polarisation selection of the digital output signal – **Polarisation**

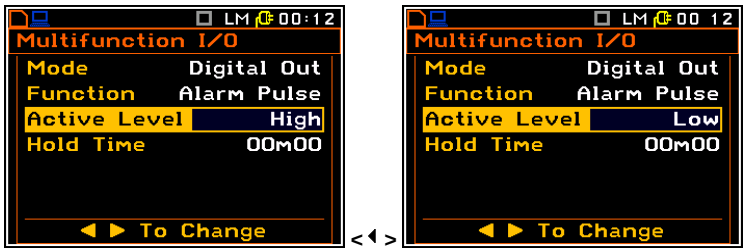
In the **Polarisation** position, it is possible to select which polarisation of the signal (negative or positive) will be valid.



Multifunction I/O windows; the Polarisation selection

Active level selection of the digital output signal - **Active Level**

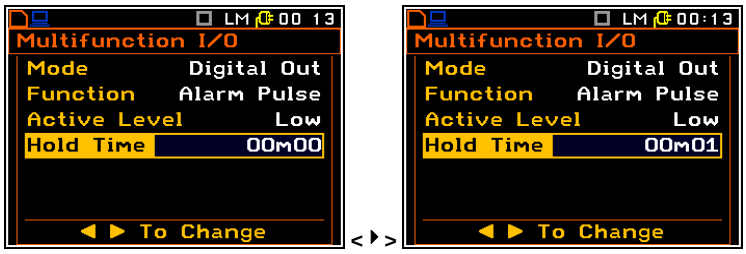
In the **Active Level** position, it is possible to select which level of the signal should be treated as a valid one ("negative" or "positive" logic): **Low** or **High**.



Multifunction I/O windows; the Active Level selection

Alarm duration selection – **Hold Time**

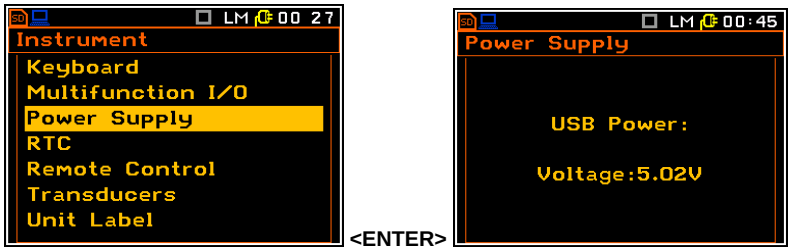
In the **Hold Time** position, it is possible to select the minimum duration of alarm signal.



Multifunction I/O windows; the Hold Time selection

8.3 Checking the powering of the instrument – Power Supply

The **Power Supply** enables the user to check the powering of the instrument: internal battery condition, source and voltage of the external power supply, and also set the battery type for checking their condition.



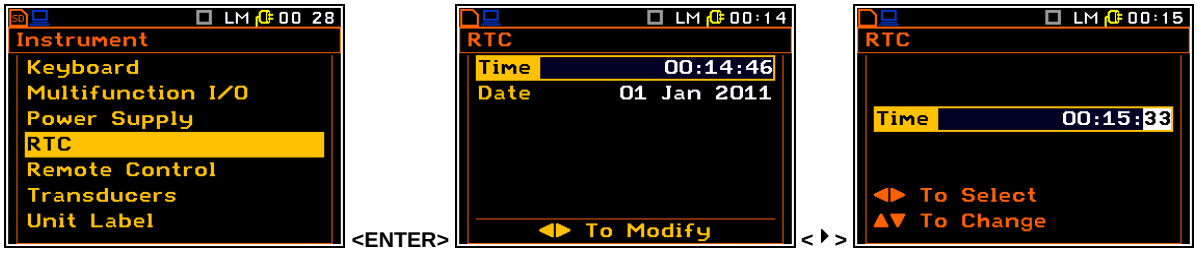
Instrument list; the Power Supply window opening

The instrument can be powered from four AA rechargeable or standard batteries or from the USB interface when its USB Device socket is connected by means of the cable to a PC. The view presented on the display for each powering sources is different. The current battery voltage is displayed together with its approximate state (in the graphical form).

Power Supply windows for different sources of powering the instrument

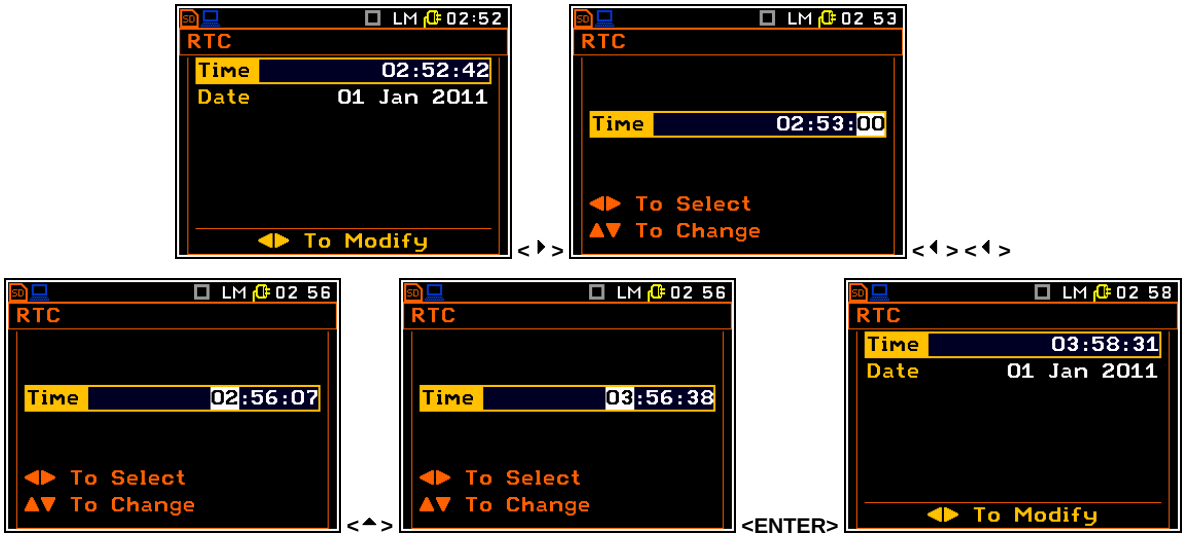
8.4 Programming the instrument's internal Real Time Clock – RTC

The **RTC** enables one to programme the internal **Real Time Clock**. This clock is displayed in the different places depending on the selected presentation mode.

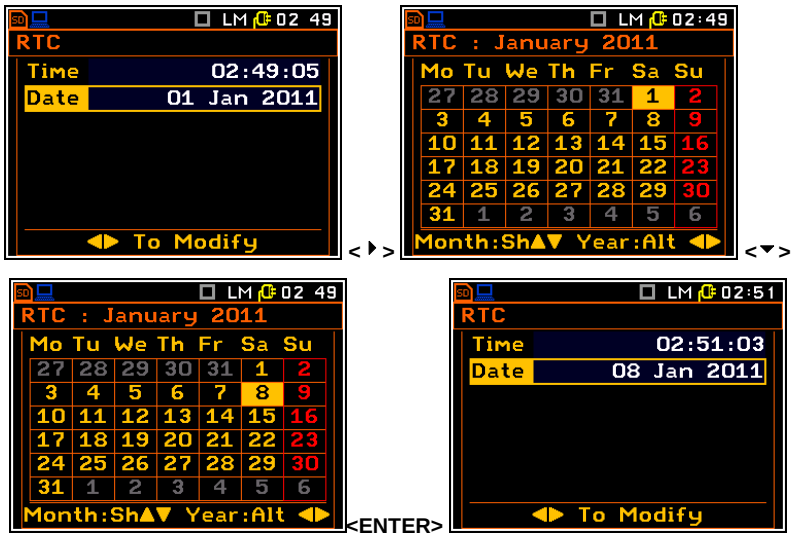


Instrument list, the RTC window opening

The time edition is doing in the special window, which is opening after pressing the **< ▶ >** push-button. The selection of the setting parameter (hour, minute, second, and also day, month and year) is performed using the **< ◀ >**, **< ▶ >** push-buttons and the change of its value – using the **< ▲ >, < ▼ >** push-buttons pressed together with the **<Alt>**.



RTC windows with the Time parameter setting

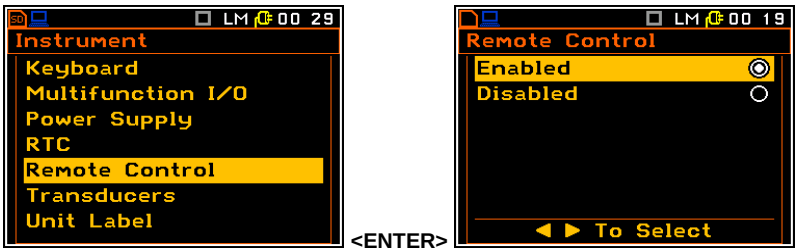


RTC windows with the Date parameter setting

The window is closed and the instrument returns to the **Instrument** list after pressing the **<ENTER>** or **<ESC>** push-button.

8.5 Activation the remote control error confirmation - Remote Control

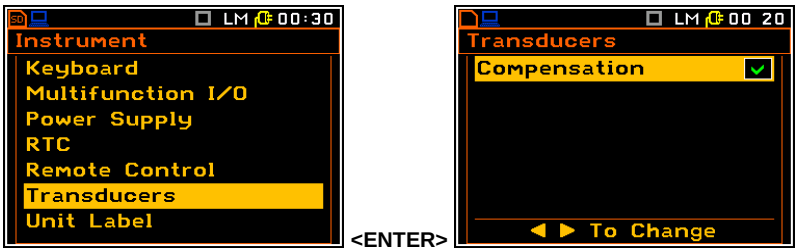
The **Remote Control** position enables the user to activate or deactivate error confirmation function. If **Remote Control** function is **Enabled** then the instrument confirms warnings after 5 seconds and the user reaction is not required. This function is very useful when the instrument is working as remote controlled. If **Remote Control** function is **Disabled** then the instrument waits for the user reaction. This mode is used in normal mode.



Instrument list; the Remote Control window opening

8.6 Transducer's compensation activation – Transducers

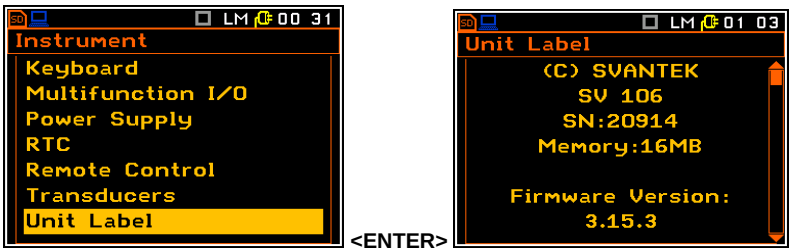
The **Transducers** position enables the user to activate or deactivate the transducer's noise compensation.



Instrument list; the Transducers window opening

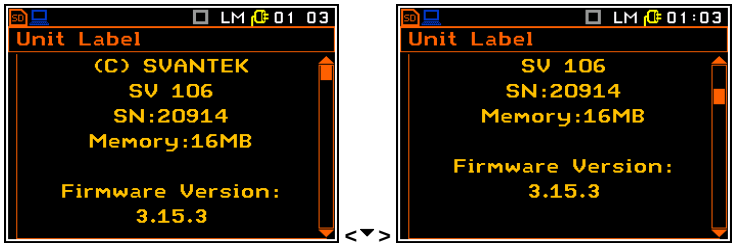
8.7 Checking the specification of the instrument - Unit Label

The **Unit Label** enables the user to check the type of the instrument, its serial number, the current software versions installed in it and the standards, which the instrument fulfils.



Instrument list; the Unit Label window opening

The displayed text is scrolled on the display after pressing the **<▲>**, **<▼>** push-buttons.

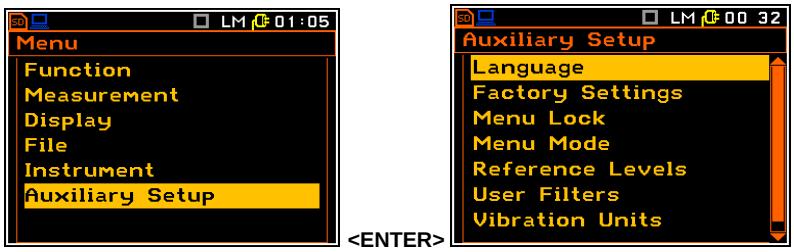


Unit Label windows; scrolling with the <▲>, <▼> push-buttons

***Notice**: The contents of the **Unit Label** should be always transmitted to the Svantek's service in the case of any problems faced by the user during the instrument's operation.*

9 AUXILIARY SETTINGS – Auxiliary Setup

The **Auxiliary Setup** list contains positions directly related with measurements and not related with the hardware components of the instrument. In order to open the **Auxiliary Setup** list the user has to: In order to open the **Auxiliary Setup** list the user has to press the **<Menu>** push-button, select the **Function** position and press **<ENTER>**.



Display in the main list; the Auxiliary Setup window opening

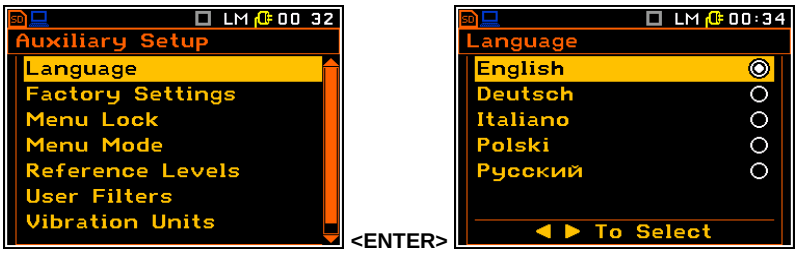
In the **Auxiliary Setup** list, the following items are available:

Language	it enables the user to set language of the user interface.
Factory Settings	it enables the user to return to the default, factory settings.
Menu Lock	it enables the user to lock the menu and to reduce the access to the program functions of the instrument.
Menu Mode	it enables the user to choose menu mode.
Reference Levels	it enables the user to program the user filters.
User Filters	it enables the user to select the Vibration units in which the results of the
Vibration Units	it enables the user to select the Vibration units in which the results of the measurements are to be given.
Warnings	it enables the user to switch on or off the warnings that can be displayed during the operation of the instrument.

:

9.4. Setting the language of the user interface – Language

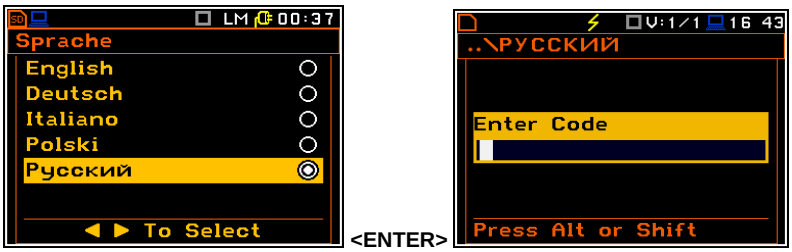
The **Language** enables one to select the language of the user interface.



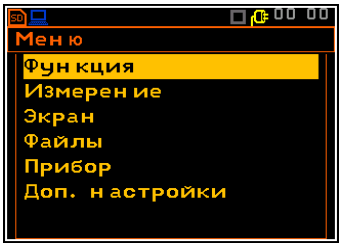
Auxiliary Setup list; the Language window opening

Language displays; change the user interface from English to German

For activation of the Russian version of the user interface, the special code has to be entered.



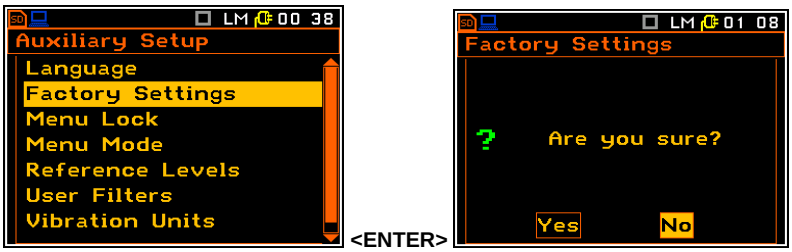
Displays during the entering of the access code to the Russian version of the user interface



Display with the Russian version of the user interface

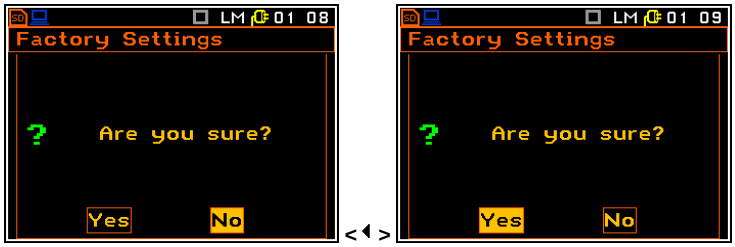
9.5. Return to the factory settings – Factory Settings

The **Factory Settings** enables the user to return to the default setup of the instrument.



Auxiliary Setup list; the Factory Settings text highlighted

After entering this position, the request for the confirmation is displayed. The proper answer for the request is selected by means of the **< ◄ >**, **< ► >** push-buttons. The instrument returns to the default set up after pressing the **<ENTER>** push-button in the case when the answer **Yes** was chosen.



Displays with the request for the confirmation for the Factory Settings execution

During the clearing process the message **WAIT...** is displayed. The following message is displayed after the return to the default settings and the instrument waits for the user's reaction.

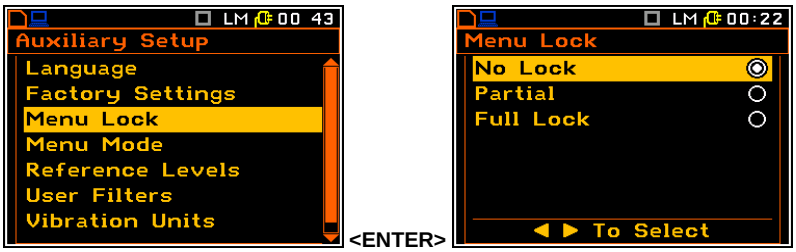
Displays during and after the execution of the Factory Settings function

The window is closed and the instrument returns to the **Setup** list after pressing any push-button with an exception of the **<Shift>** and the **<Alt>** one.

The factory setup can be install also by means of **<Shift/Enter>** and **<Alt/Start>** push-buttons pressed together.

9.6. Locking the menu - Menu Lock

The **Menu Lock** sub-list enables the user to lock (**Pertial** or **Full Lock**) and unlock the menu.

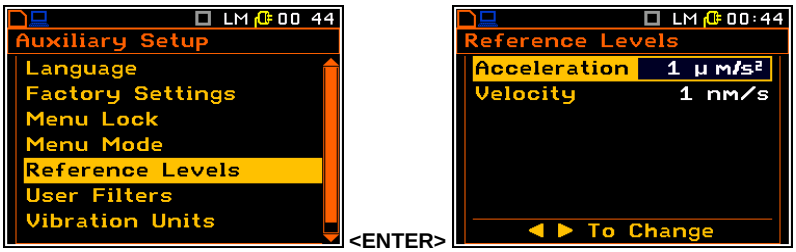


Auxiliary Setup list; the Menu Lock window

In the case of default **No Lock** option all available positions in the menu are accessible due to the settings, which were made. The activation of **Partial** results in locking access to the **Menu** options, which are responsible for measurement parameters. In the case of **Full Lock** no one position from the **Menu** lists is accessible and after attempt of enter **Menu** the **Menu Lock** window appears on the display. The **Menu** is available after unlocking it.

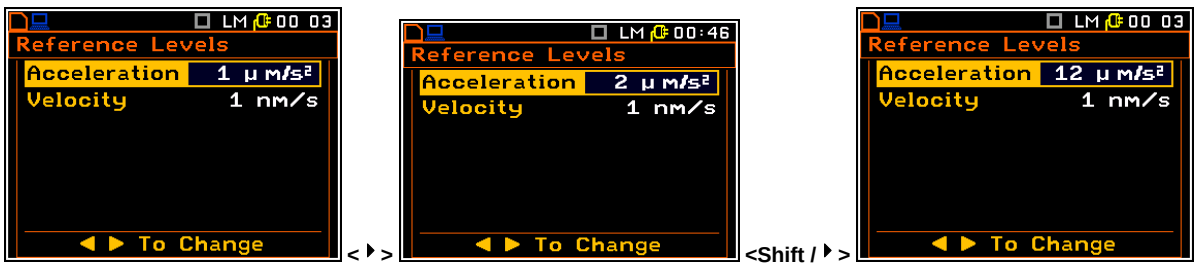
9.7. Reference signal in vibration measurements - Reference Levels

The **Reference Levels** sub-list enables the user to set the reference level of the vibration signal. The values, which are set here, are taken into account during the calculations of the measurement results expressed in the Logarithmic scale (with the **dB** as the units).



Auxiliary Setup list and the Reference Levels window

In the **Acceleration** position the user can set the reference level of the acceleration signal from **1 µms^{-2}** to **100 µms^{-2}**.

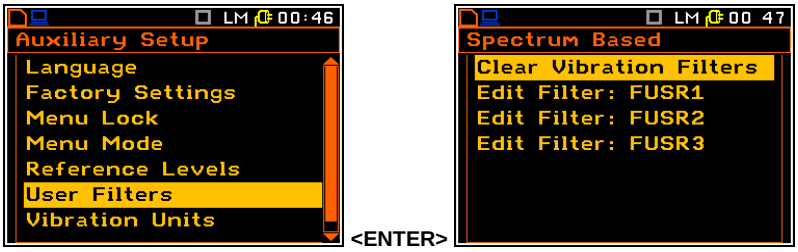


Reference Levels windows; the reference level setting of acceleration signal

In the **Velocity** position, the user can set the reference level of the velocity signal. It is possible to set this level from **1 nms^{-1}** to **100 nms^{-1}**.

9.8. User filter setting – User Filters

The **User Filters** position enables the user to introduce the values of the coefficients of the user filters. The **User Filters** position opens the window in which the user can clear (**Clear Vibration Filters**) or edit (**Edit Filter**) the filter coefficients for selected user filter **FUSR1**, **FUSR2** and **FUSR3**.

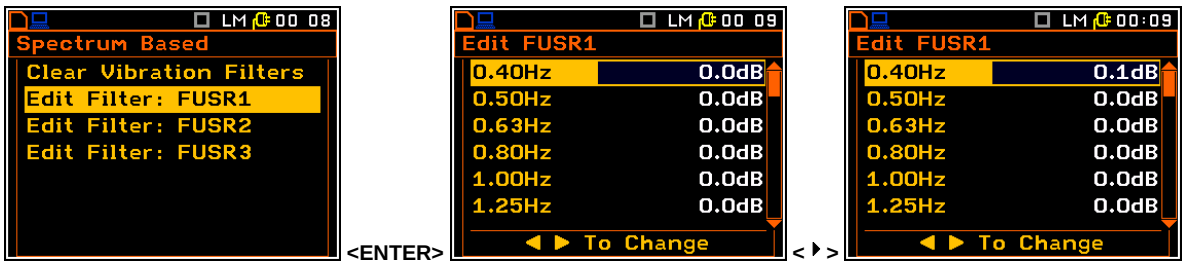


Auxiliary Setup list; the Spectrum Based window opening

The **Clear Vibration Filters** position opens the window with warning before deletion the user filter coefficients. In case of positive answer, all coefficients of selected filter will be zeroed.

Auxiliary Setup list; clearance the user filter coefficients

The **Edit Filter** position opens the window with table of filter coefficients. All positions in this table can be edited.



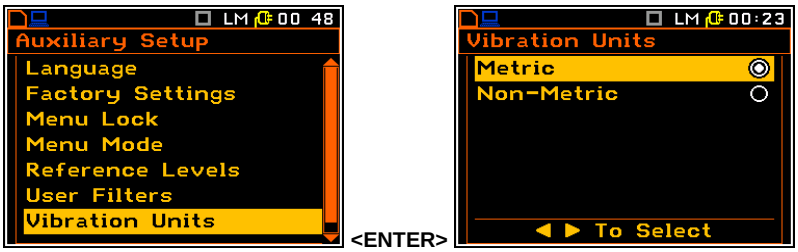
Auxiliary Setup list; user filter coefficient edition

The opened window contains the centre frequencies of the filters and their coefficients:

- **0.40 Hz:** available values for 0.4 Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **0.50 Hz:** available values for 0.5 Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **0.63 Hz:** available values for 0.63 Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **0.80 Hz:** available values for 0.8 Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **1.00 Hz:** available values for 1Hz centre frequency filter: **-100.0dB ... 100.0dB**
- **...**
- **2.50kHz:** available values for 2.50 kHz centre frequency filter: **-100.0dB ... 100.0dB**

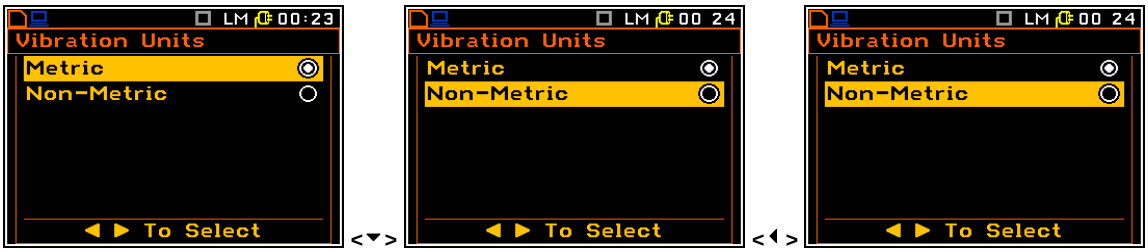
9.9. Selection of the Vibration units - Vibration Units

The **Vibration Units** position enables the user to select the metric or non-metric units.



Auxiliary Setup list, the Vibration Units window opening

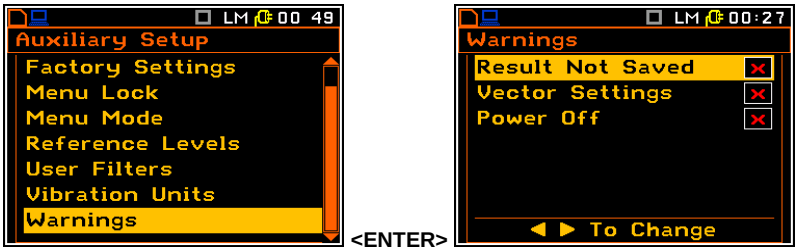
It is possible to select the **Non-Metric** units (e.g. g, ips, mil etc.) or **Metric** units (e.g. m/s^2, m/s, m etc.).



Vibration Units windows; Non-metric units selection

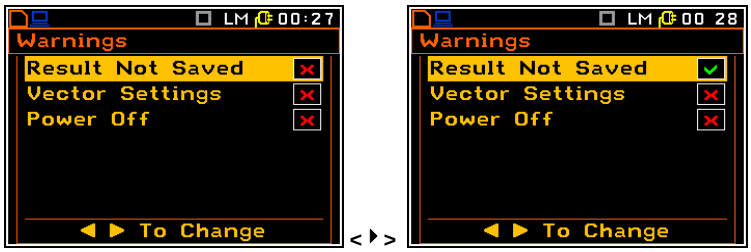
9.10. Warnings selection – Warnings

The **Warnings** enables the user to select the messages, which could be displayed during the operation of the instrument.



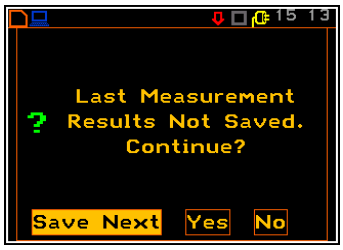
Auxiliary Setup list, the Warnings window opening

When the **Result Not Saved** position is set to be active the special warning can be displayed after pressing the **<Start/Stop>** push-button. It will be happened in a case when the result of the previous measurement was not saved in a file of the instrument.

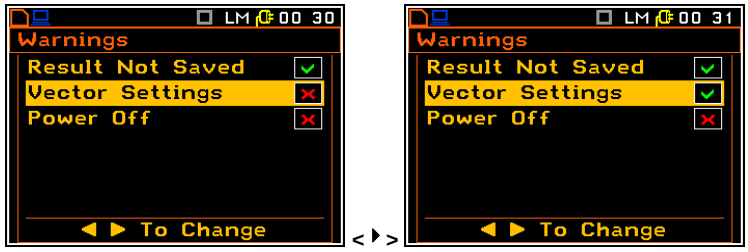


Warnings windows; Results Not Saved selected

The question **Continue?** appears with the warning message. There are three options: **Yes**, **No** or **Save Next**. If **Yes** is chosen, the instrument returns to the active mode of result presentation starting the new measurement process. If **No** is chosen, the instrument returns to the active mode of measurement result's presentation without starting the new measurement process. If **Save Next** option is chosen, then the measurement results are saved.

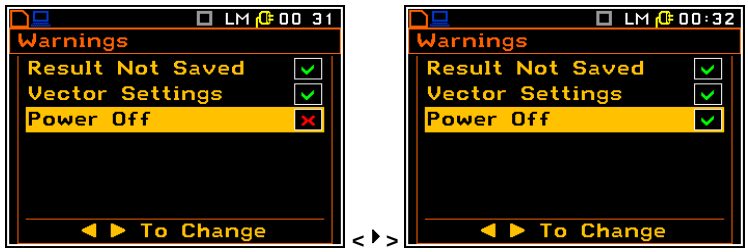


Displays with Last Results Not Saved warning



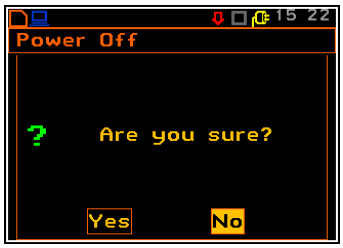
Warnings windows; Vector Settings selection

If parameter **Power Off** is switch on then the instrument will send the message in case when the user is switching it off.



Warnings windows; Power Off selection

When the **Power Off** position is set to be active the special warning appears after pressing the **<On/Off>** push-button to switch off the instrument.



Displays with Power Off warning

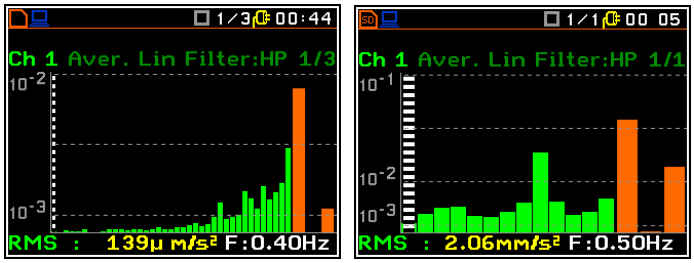
10 1/1 AND 1/3 OCTAVE ANALYSER

The instrument operates as **1/1 Octave** or **1/3 Octave** analyser in a very similar way to the **Level Meter** mode and, in addition, **1/1 Octave** or **1/3 Octave** analysis is performed in parallel with the **Level Meter** operations. All 1/1-octave (with the centre frequencies from 2 kHz down to 0,5 Hz; in base two system) and 1/3-octave (with the centre frequencies from 2,50 kHz down to 0.40 Hz; in base two system) digital pass-band filters are working in the real-time with the **HP** weighting filter and the linear RMS detector.

Notice: *The TOTAL RMS results are measured with the weighting filters (**A**, **C**, **Z** or **S1**, **S2**, **S3** - in the case of sound measurements; **Z**, **PR2**, **PR3** or **S1**, **S2**, **S3** – in the case of vibration measurements) without taking into account the settings of the level meters for profiles. The spectra are always linearly averaged. Thus, the **TOTAL** values from **1/1 Octave** or **1/3 Octave** analysis can be different from those obtained for the profiles (if the **RMS Integration** was set as **Exp**).*

The results of **1/1 Octave** and **1/3 Octave** analysis (also called spectrum analysis) can be examined by the user on a display in the **Spectrum** presentation mode. The availability of this mode can be switched on or off by the user (*path: <Menu> / Display / Display Modes*).

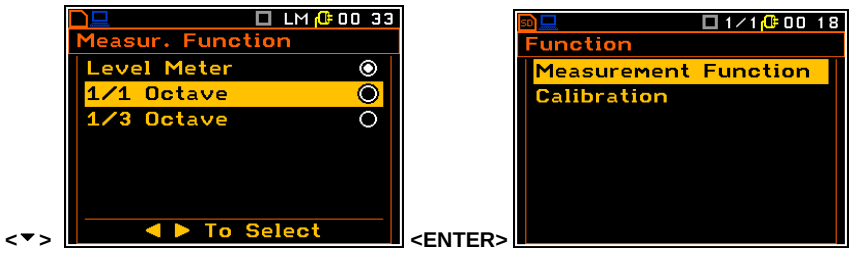
1/1 Octave and **1/3 Octave** spectrum for all centre frequencies of pass-band filters together with three **Total RMS** values measured with selected by the user weighting filters are presented in the switched on **Spectrum** mode.



1/1 Octave analysis in Spectrum display mode

10.1. Selection of 1/1 Octave or 1/3 Octave analysis mode

In order to select the **1/1 Octave** or **1/3 Octave** analysis mode the user has to enter the **Function** list and open the **Measurement Function** window.



1/1 Octave analysis mode activation

***Notice**: It is not possible to change the current function during the measurements. The instrument displays in this case for about 2 seconds the text: **"Measurement in Progress"**. In order to change the current measurement function the instrument must be stopped!*

10.2. Setting the parameters of 1/1 Octave and 1/3 Octave analysis -

The execution of **1/1 Octave** or **1/3 Octave** analysis bases on the certain number of the parameters, some of which can be set in the different windows of the **Measurement** list. Other parameters are set by default.

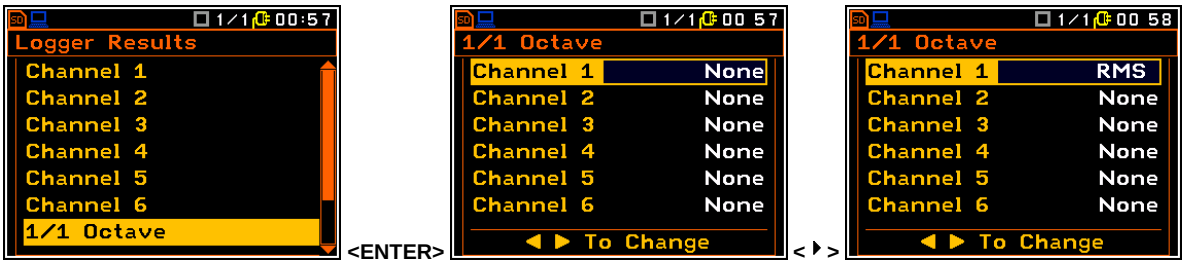
Default settings in **1/1 Octave** and **1/1 Octave** analysis:

- weighting filter: **HP** - type 1 according to the IEC 61672-1 standard (the filter characteristics are given in Appendix D);
- frequency band:
- total values:

The output of the selected **1/1 Octave** or **1/3 Octave** filter can be also used as the triggering signal (*path: <Menu> / Measurement / Trigger Conditions / Channel x / 1/1 Octave or 1/3 Octave*).

10.3. Activation of saving of 1/1 Octave and 1/3 Octave analysis results in the logger's file - Logger Results

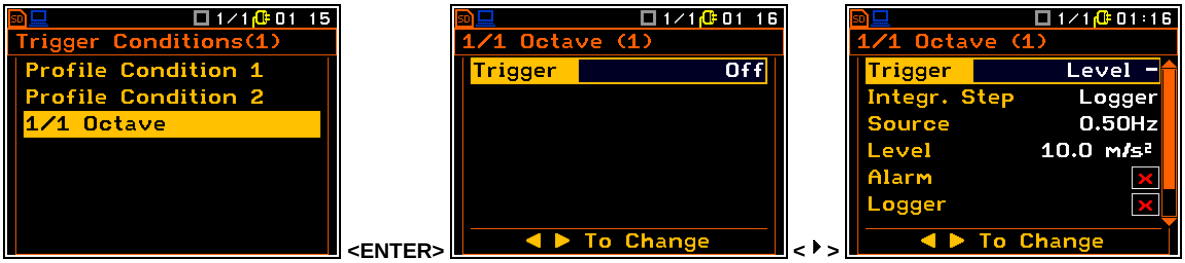
The **RMS** results from **1/1 Octave** or **1/3 Octave** analysis can be saved in the logger's file. The spectrum saving in the logger file is program for each channel in the appropriate window (*path: <Menu> / Measurement / Data logging / Logger Results / 1/1 Octave or 1/3 Octave*). If the **None** value is selected in the position **Channel x** then spectrum data will not be saved in the logger file. If **RMS** value is selected, then RMS spectrum will be saved in the logger file for this channel.



Spectrum windows with disabled and enabled savings of 1/1 Octave RMS spectrum

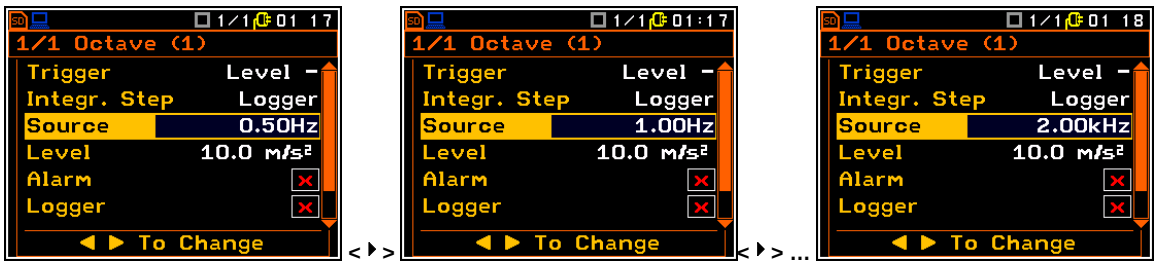
10.4. Selection of the result which triggers registration in logger in 1/1 Octave and 1/3 Octave analysis - Logger Trigger

For the **1/1 Octave** or **1/3 Octave** analysis functions it is possible to define trigger events based on band level of the spectrum. For this purpose the user has to set parameters in the **1/1 Octave** or **1/3 Octave** window (*path: <Menu> / Measurement / Trigger Conditions / Channel x / 1/1 Octave or 1/3 Octave*)



Trigger condition set up and based on 1/1 octave analysis for first channel

The trigger condition can be defined for the selected in the position **Source** bandpass of **1/1 Octave** filters (**0.50 Hz**, **1.00 Hz**, **2.00 Hz**, **4.00 Hz**, **8.00 Hz**, **16.0 Hz**, **31.5 Hz**, **63.0 Hz**, **125 Hz**, **250 Hz**, **500 Hz**, **1.00 kHz** and **2.00 kHz**), or **1/3 Octave** filters (**0.40 Hz**, **0.50 Hz**, **0.63 Hz**, **0.80 Hz**, **1.00 Hz**, **1.25 Hz**, **1.60 Hz**, **2.00 Hz**, **2.50 Hz**, **3.15 Hz**, **4.00 Hz**, **5.00 Hz**, **6.30 Hz**, **8.00 Hz**, **10.0 Hz**, **12.5 Hz**, **16.0 Hz**, **20.0 Hz**, **25.0 Hz**, **31.5 Hz**, **40.0 Hz**, **50.0 Hz**, **63.0 Hz**, **80.0 Hz**, **100 Hz**, **125 Hz**, **160 Hz**, **200 Hz**, **250 Hz**, **315 Hz**, **400 Hz**, **500 Hz**, **630 Hz**, **800 Hz**, **1.00 kHz**, **1.25 kHz**, **1.60 kHz**, **2.00 kHz**, and **2.50 kHz**), **Total Level** results with appropriate filters can also be selected as a source.



Logger Trigger windows; the selection of the signal used for triggering

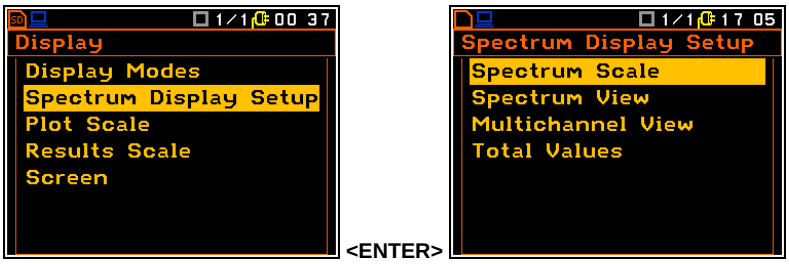
10.5. Display options in 1/1 Octave and 1/3 Octave analysis mode

The **Display** list is used for setting the various parameters, which are mainly dedicated for the control of the spectrum view. The following windows contain the elements that influence the presentation of the results of **1/1 Octave** and **1/3 Octave** analysis:

Display Modes enables one to switch on the spectrum presentation mode;

Spectrum Display Setup enables one to select options for spectrum presentation:

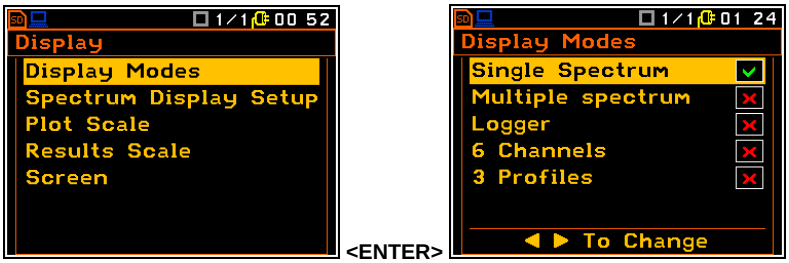
- **Spectrum Scale** enables one to change the scale of the vertical axis of the graphical presentation, switch on or off the grid, switch on or off autoscale;
- **Spectrum View** enables one to choose the type of the spectrum to be presented;
- **Multichannel View** enables one to select how many channels will be displayed simultaneously,
- **Total Values** enables one to select parameters for **Total Values** presentation.



Spectrum Display Setup window opening

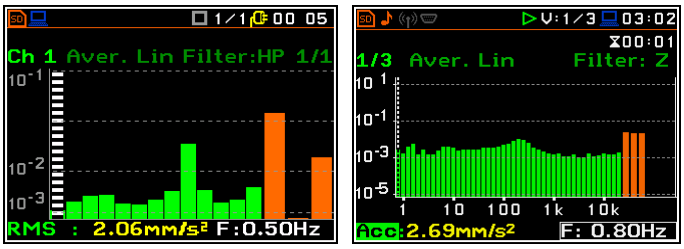
10.6. Presentation of 1/1 Octave and 1/3 Octave analysis results

The **Single Spectrum** and **Multiple spectrum** positions of the **Display Modes** list are accessible only for **1/1 Octave** and **1/3 Octave** functions.



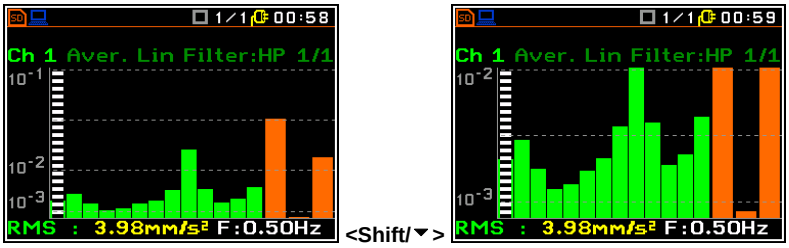
Display Modes window opening

When **Single Spectrum** mode is switched on the measurement screen in Spectrum visualisation mode is like below.



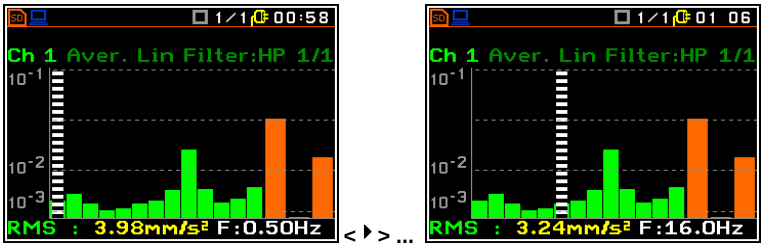
Displays in Single Spectrum view for 1/1 Octave and 1/3 Octave function

The user may shift the Y-axis during the spectrum presentation after pressing the **<Shift>** and **<▲>** (or the **<Shift>** and **<▼>**) push-buttons.



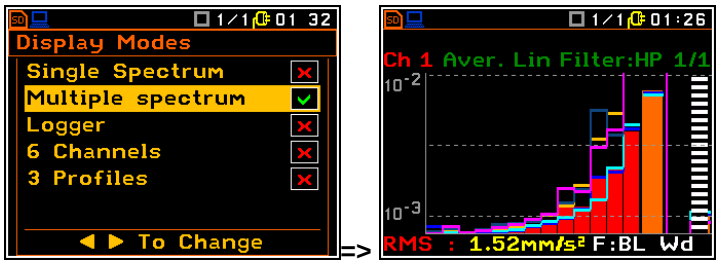
1/1 Octave analysis with the shifted horizontal axis in relation to vertical one

The user may change the cursor position by means of the **<◀>**, **<▶>** push-buttons. The frequency and appropriate value are presented in the line below the plot.



Change the cursor position for the 1/1 Octave spectrum

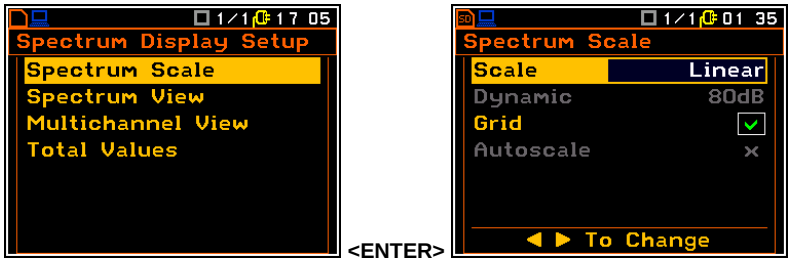
When **Multiple spectrum** mode is switched on the measurement screen in Spectrum visualisation mode is like below.



Displays in Multiple spectrum view for 1/1 Octave function

10.7. Setting the scale of the spectrum results presentation – Spectrum Scale

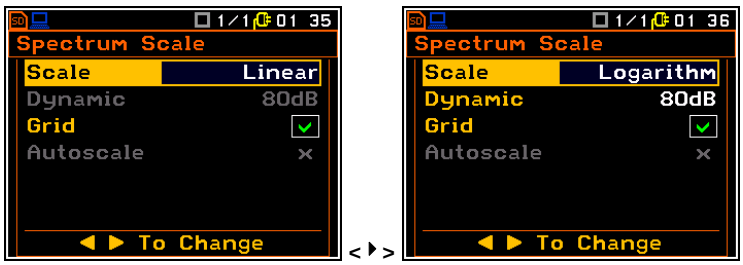
The **Spectrum Scale** sub-list enables the user to change the scale in the available modes of graphical presentation of the measurement results and switch on/off the grid.



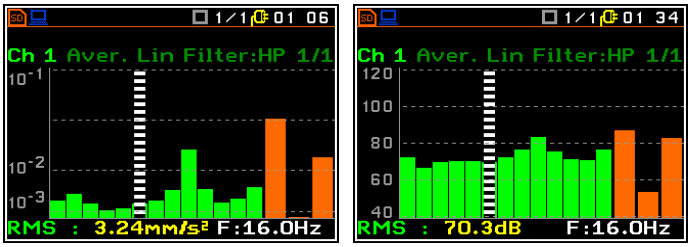
Spectrum Scale window opening

Setting the scale of the measurement results presentation – **Scale**

Two options are available for the **Scale** position: **Linear** and **Logarithm**. In the case of the first one the graphical presentation and the units both are linear. In the latter case the graphical presentation is given in the logarithmic scale and the measurement results are expressed in decibels (the result is related to the values set in the **Reference Level** (*path: <Menu> / Auxiliary Setup / Reference Levels*).



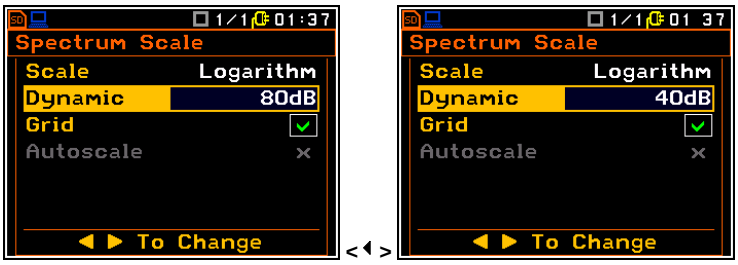
Display Scale window, scale selection in vibration modes



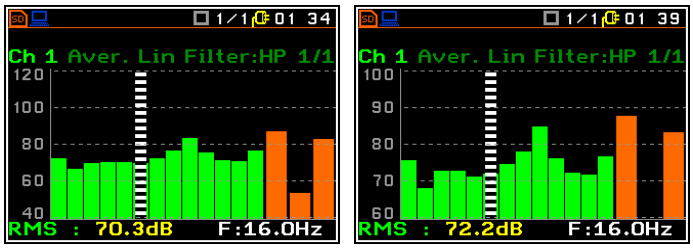
Spectrum presented in linear and logarithmic scale

Scaling the vertical axis of the graphical mode presentation – **Dynamic**

The **Dynamic** position enables the user to select the proper scaling of the graphical mode presentation. In the case of the vertical axis one can obtain the double, four times and eight times expansion (as the default the vertical axis corresponds to 80 dB, after expansion it corresponds to 40 dB, 20 dB and 10 dB – respectively).



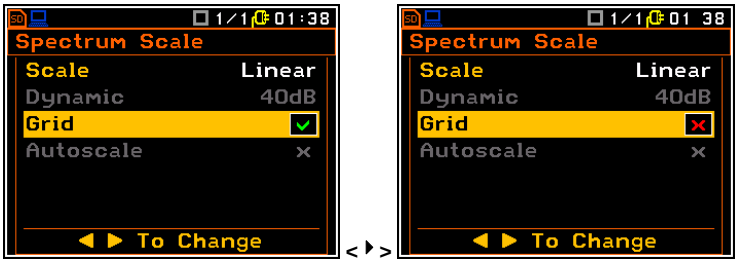
Dynamic parameter changing



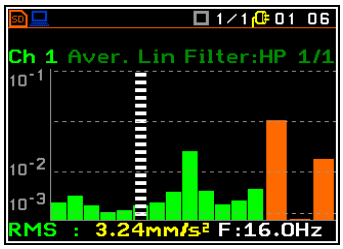
Displays with the 1/1 Octave results presented with different Dynamic parameter (80 and 40 dB)

Switching on/off the grid in the graphical mode presentation – **Grid**

The **Grid** enables the user to switch on or off the grid in any graphical presentation.



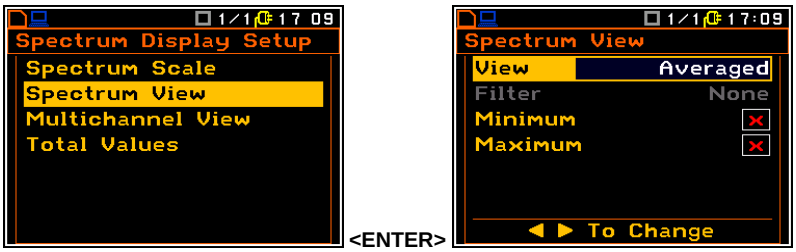
Grid option selection and switching it off



Displays with the grid switched on and off

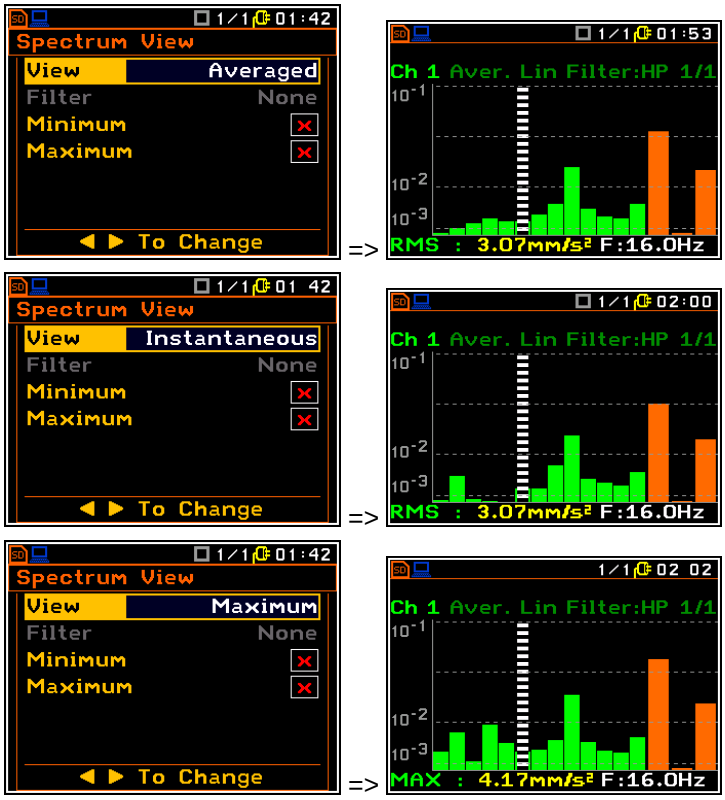
10.8. Setting the parameters of the spectrum presentation - Spectrum View

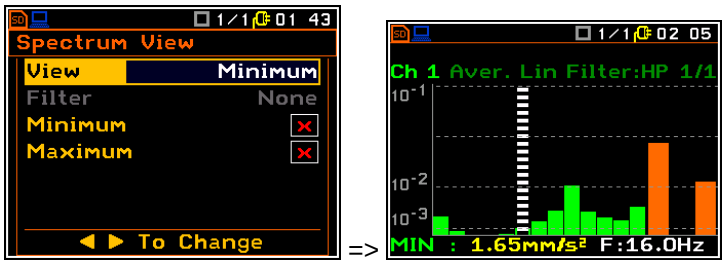
In the **Spectrum View** window the user can program the view of screen in the **Single spectrum** and **Multi spectrum** presentation modes and to set: spectrum type to view (**View**),.filter (**Filter**), minimum and maximum spectrum (**Minimum** and **Maximum**).



Spectrum View window opening

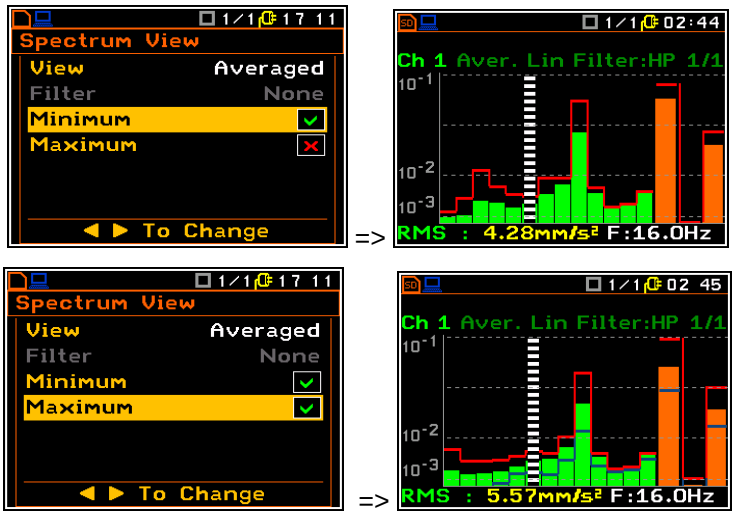
In the position **View** the user can select the different type of spectrum like: **Averaged**, **Instantaneous**, **Max** or **Min**.





Presentation of different 1/1 Octave spectra

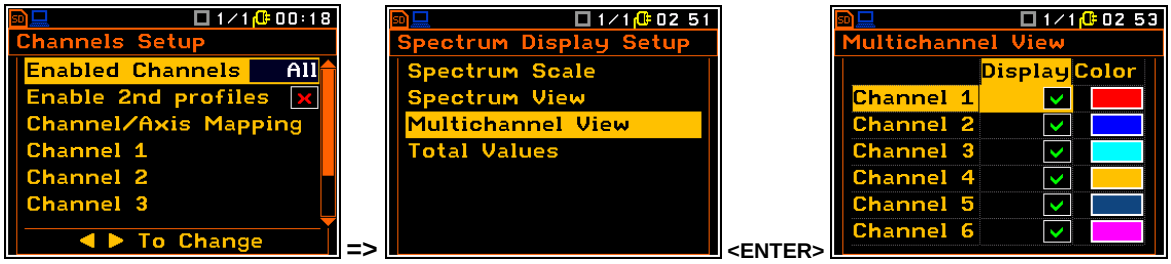
The user can additionally switch on the presentation of **Max** and/or **Min** spectrum.

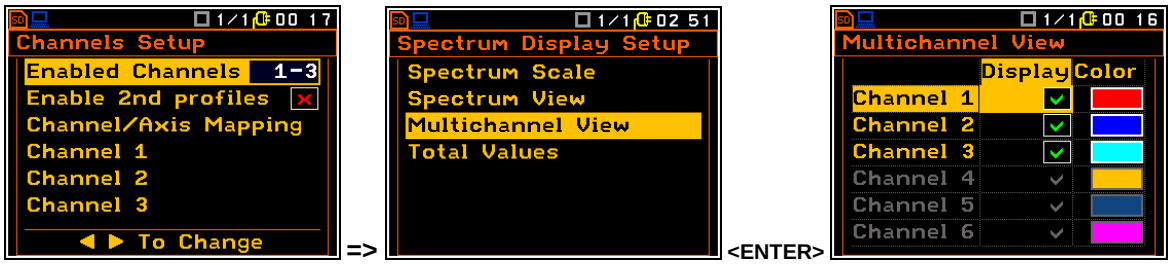


Max and Min spectra presented on the spectrum plot

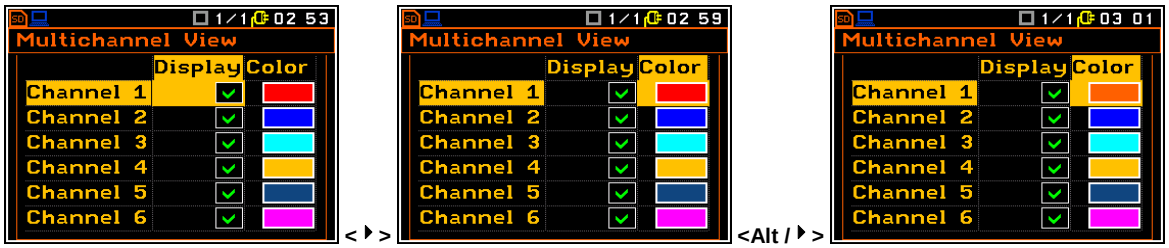
10.9. Selection of the channels for presentation – Multichannel View

The **Multichannel View** window enables one to select for which channels spectrum will be viewed during multi spectrum display mode and to assign special color for the spectrum curve.

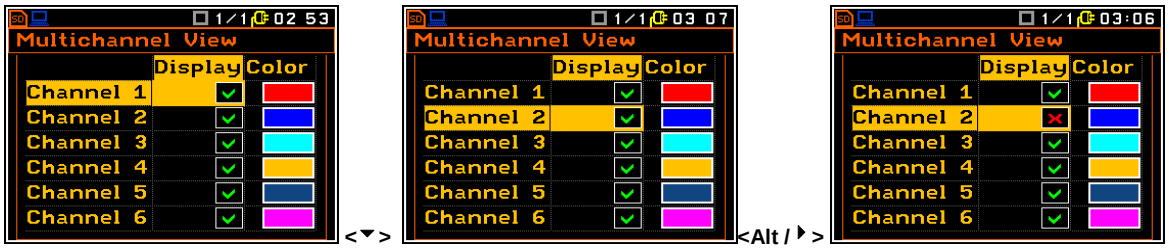




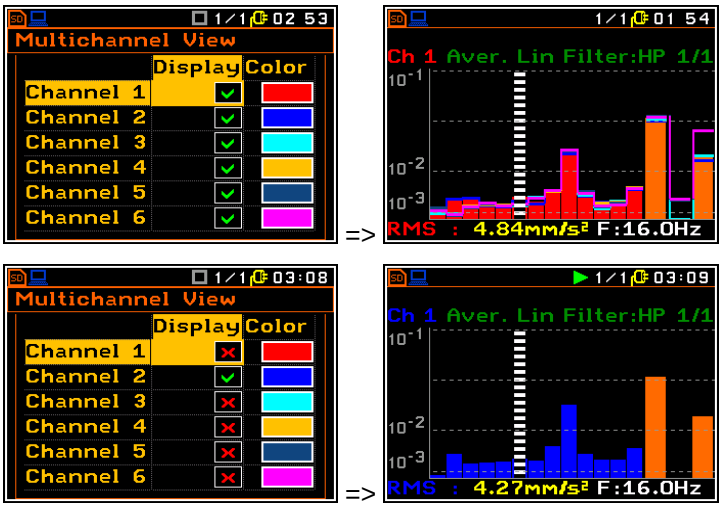
Multichannel View window opening



Selection Color position and changing the color for Channel 1 spectrum



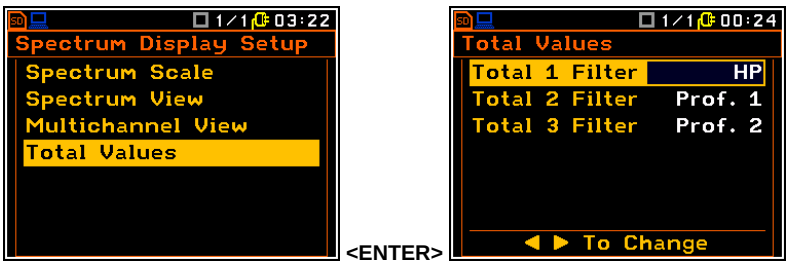
Switching off the Channel 2 spectrum presentation



Spectrum presentation views for different settings in Multichannel View window

10.10. Setting the parameters for total values – Total Values

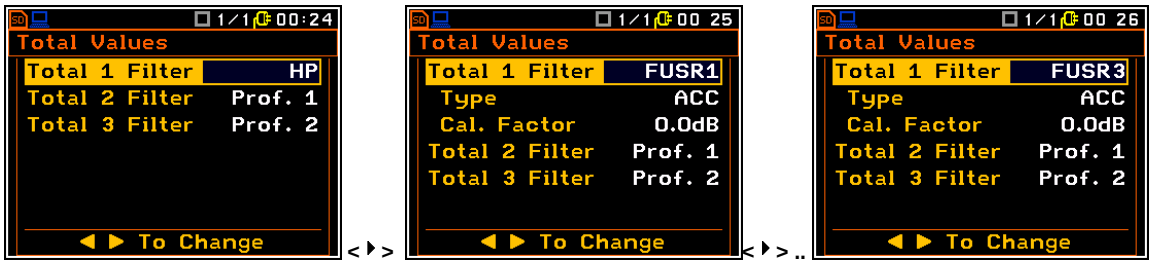
The position **Total Values** enables the user to program parameters for total values calculation. The are three total values, calculated for each channel and for all three total values it is possible to define weighting filter, integration method and accordingly type of signal measurement (acceleration, velocity or displacement) as well as calibration factor.



Total Values window opening

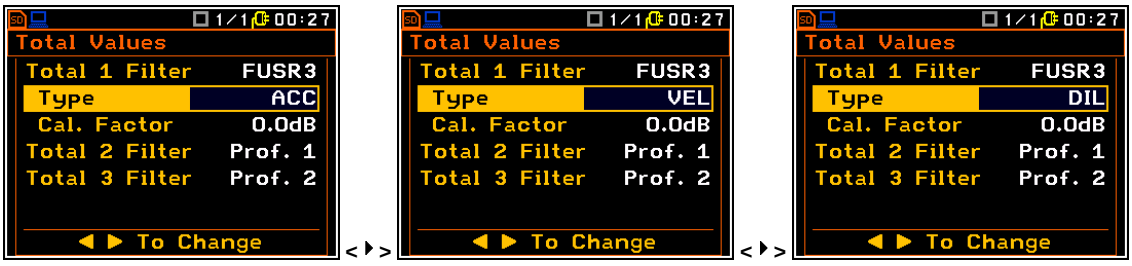
By default for the first Total value **HP** filter is denote. Second and third Totals have same filters as were set up for profiles (**Prof. 1** and **Prof. 2**) in the **Channels** window (*path: <Menu> / Measurement / Channels*).

It is possible to select also tree user filters: **FUSR1**, **FUSR2** and **FUSR3**. When user filter is selected, two additional position appear: **Type** and **Cal. Factor**.



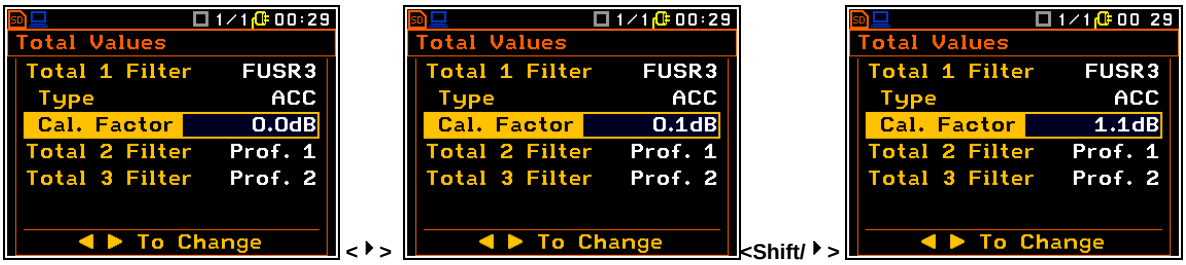
Selection of filter for Total 1

In the position **Type** one can define type of integration to present measured signal as acceleration (**ACC**), velocity (**VEL**) or displacement (**DIL**).



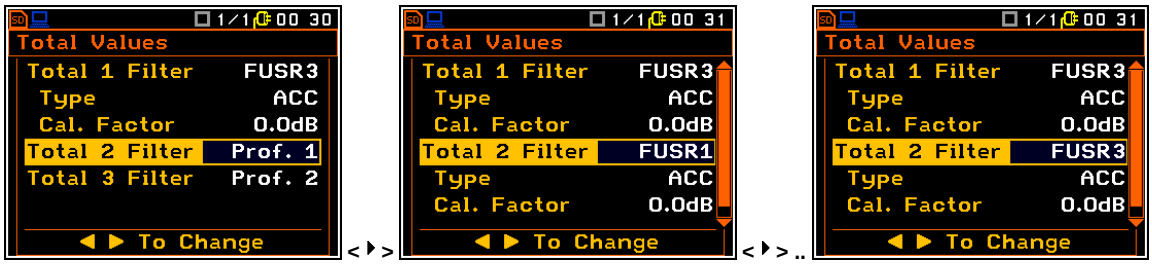
Selection of integration type for calculation acceleration, velocity or displacement

In the position **Cal. Factor** one can define additional calibration factor which will be applied to the calculation os Total value.

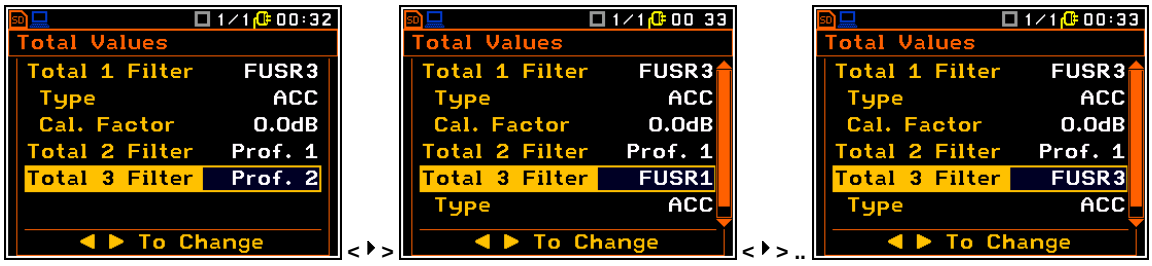


Additional calibration factor selection for Total 1 calculation

Same settings can be done for Total 2 and Total 3 values.



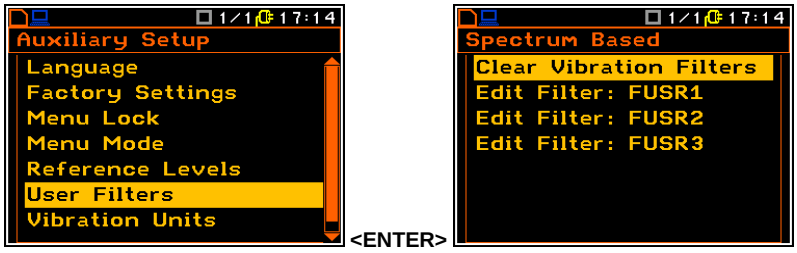
Selection of filter for Total 2



Selection of filter for Total 3

10.11. Setting user filter coefficients for 1/1 Octave and 1/3 Octave analysis – User Filters

The **User Filters** position enables the user to introduce the values of the coefficients of the user filters for **1/1 Octave** and **1/3 Octave** analysis. The description of this window was already made above.



User Filters window opening